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Correspondence.—Wishing to make this JOURNAL a gazette of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, correspondence is solicited for publication from all who make the study of those subjects a pleasure or a profession.

The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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MR. CHARLES W. BLODGET, formerly Secretary and Manager of the old Williamsburgh Gas Light Company, of Brooklyn, New York, and at about the same time Manager of the old Brooklyn (N. Y.) Gas Company, was found dead, in a room in the Colonial Hotel, Harlem, N. Y., the afternoon of last Thursday. He was in his 55th year. Deceased had been a member of the American Gas Light Association, of the New England Association of Gas Engineers and of the Western Gas Association. In the middle eighties he was pretty well known in the gas trade in this section of the country, especially so in connection with the preliminary negotiations that led to the formation of the Brooklyn Union Gas Company.

[OFFICIAL NOTICE.]

Where to Find the Western Gas Association's Exhibit, and the Custodian Thereof, at the World's Fair.

To the Fraternity: The exhibit of the Western Gas Association, at the World's Fair, St. Louis, is located in Section 33A, Liberal Arts Building, where Mr. Fred. R. Persons, who is in charge of the same, will always be on hand to receive visitors and to explain anything that requires explaining.

[NOTICE.]

Twelfth Annual Meeting, Michigan Gas Association.

JACKSON GAS COMPANY,
JACKSON, MICH., July 20, 1904.

To the Members of the Michigan Gas Association: Preparations for the meeting of the Michigan Gas Association, to be held in Jackson, September 21st and 22d, 1904, are now well underway. The following papers are promised definitely:

"Retort House Practice in a Small Works," by Mr. George C. Turner, Secretary Coldwater (Mich.) Gas Light and Fuel Company.

"Temperatures as Applied to the Production and Purification of Coal Gas," by Mr. V. F. Dewey, Asst. Supt., Detroit City Gas Company.

"Commercial Lighting," by Mr. R. Schacklette, Manager Adrian (Mich.) Gas Company.

Also, a most interesting report on "Naphthaline," by Messrs. White and Ball.

In this connection let me call your attention to the "Question Box," with its special feature known as the "Trouble Box," which is in charge of Mr. E. F. Lloyd. Every member can help make this special feature a success by sending to Mr. Lloyd good, live questions or by relating their experience, or by asking help on the troubles they have had during the past year. If you have no questions to ask, no new experiences during the past year, and have encountered no troubles, this "Question Box" cannot help you. If the contrary is true, write to Mr. Lloyd, and *do it now*. Remember, all these things will be referred to some member for investigation, all of which takes time, and you should be as prompt as possible in communicating with Mr. Lloyd.

Don't forget to bring an application for membership from some fellow not now in the fold, and *be sure to attend the meeting yourself*.

Wishing that I will have the pleasure of welcoming you in Jackson,

Yours very truly, S. E. WOLFF, President.

[OFFICIAL NOTICE.]

Wrinkle Department, Western Gas Association.

OFFICE OF EDITOR WRINKLE DEPARTMENT,
ST. LOUIS, MO., July 25, 1904.

To the Members of the Western Gas Association: We again invite contributions to the Wrinkle Department of the Western Gas Association for the meeting of 1905. The Editor wishes to call the attention of the members of the Western Gas Association, and of the gas fraternity at large, to the fact that the "Western" has done good work in this de-

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partment in the past; that its Wrinkles have been of value to many, and that it proposes to continue the good work.

The Editor further wishes to suggest that an earnest effort be made to improve the quality of the Wrinkles submitted, as a great many of the devices, while of undoubted practical value, are such as any gas works' foreman should know. We desire the Wrinkles which have a greater bearing on the scientific and technical portion of our business. Of course, there will always be room for the little, handy, practical devices, which so often help us over the rough places. We will gladly receive them, but we should all aim to place the gas business on a par with other scientific and engineering enterprises which are practically in a basis of exact knowledge and high efficiency.

To that end, therefore, we desire to secure a large collection of Wrinkles for the 1905 meeting. Give us the benefit of the mathematical, chemical, thermal and other devices which have helped you in designing or improving your plants; do not hesitate to send in the practical devices which are not on record so far; submit the ideas which have made the business end a success; and, finally, let every individual contribute his portion, so that the result may be worthy the achievements of the past, and a credit to the Western Gas Association.

The following wrinkle is submitted as a sample to guide others somewhat in working out their contributions to this department. This describes a method of regulating the pressure on the outlet of a holder in proportion to the rate of sendout, and was contributed by the writer to another Association some time ago.

"The essential idea of street pressure regulation is to maintain a certain pressure at the consumers' meters within a small percentage either way of the fixed pressure. As the consumption increases or decreases, the holder pressure should be raised or lowered. This is usually done by having recording pressure gauges located in the district supplied by the holder, and raising or lowering the holder pressure until the best average for the district is reached.

"Now, it is, of course, true that the same conditions of consumption never obtain on successive days or months, and, therefore, the following automatic indicator was suggested by the writer: In the outlet pipe of the holder we place a Pitot tube facing the holder. Naturally, the opening from the Pitot tube which faces the stream of flowing gas gives the pressure due to the sum of the static head plus the impact or velocity head, whereas the side openings give the pressure due to the static head only. Therefore, any variation in the rate of flow of the gas is at once indicated by the variation in differential pressure from the two openings of the Pitot tube.

"By using a very sensitive differential pressure gauge, we can thus observe this variable rate of flow. It is, of course, necessary to calibrate the instrument for each holder to be able to tell what pressures to carry on the outlet pipe for each division on the sensitive differential gauge, and it would probably be well to check this three or four times during the year. The Laclede Gas Light Company has so far secured three satisfactory types of extremely sensitive differential pressure gauges, and we have arranged them with two scales, one of which shows the divisions in millimeters and the other gives the proper pressures to be carried on the holder outlet opposite the indicator on the gauge. The writer purposely refrains from adding drawings or too much detail to the above description, as he merely wishes to submit one idea, which he hopes will suggest many others to help swell the contributions."

We must start the work at once; therefore, please send your ideas to the Editor, 716 Locust street, St. Louis, Mo., and oblige, Yours truly,

W. A. BAEHR, Editor Wrinkle Department.

BRIEFLY TOLD.

STATION METERS.—Our current issue contains the closing chapters of the record of the Gas Congress, the sessions of which were of much interest, and in them no matter of greater moment was brought out than that contained in the paper, by Mr. Donald McDonald, of Albany, N. Y., on "Station Meters," the concluding portion of which also appears to-day. The author it may certainly be said knows all about gas meters, for his knowledge of them was acquired in practical way by many years of study in one of the best equipped meter shops in he country and under the tutelage of men whose life's work was in and of the industry. Without hesitation we say that Mr. McDonald's paper will for many a year to come be referred to as a standard treatise on the history, construction, operation and care of station meters, the working of which is as necessary to the sensible operation of a gas plant as is the pulsation of the heart to the maintenance of life. His descriptions and suggestions are of the simplest and clearest sort, and it is our hope that Mr. McDonald will eventually see his way clear towards putting the matter together in book form for the better assistance of the fraternity, who will often wish to recur to the text for reference and guidance.

NOTES—

THROUGH the courtesy of the publishers, Messrs. J. G. Hammond & Co., Limited, of London and Birmingham, we are in receipt of a copy of the "Directory of Gas Undertakings," for 1904, edited as usual by Mr. Charles W. Hastings. The book, which is of the pocket edition sort, is divided into four sections, titled as follows: Sec. 1. Gas undertakings of Great Britain and Ireland. Sec. 2. Gas undertakings of the British Colonies and the colonial and foreign gas companies with offices in London. Sec. 3. Gas undertaking of America and the Dominion of Canada. Sec. 4. Gas undertakings of the Continent of Europe. The Editor, it would seem to us, in his chapters on American gas companies, has touched very freely on Brown's Directory here, but it is likely such wholesale reproduction would not have been made unless some traffic arrangement between the owners of the English and American books was agreed upon.

THE proprietors of the Hannibal (Mo.) Gas and Water Company are expending several thousand dollars in main extensions. The Company is experiencing a good, round increase in output.

MESSRS. A. F. CAMPBELL and William Dunn, to whom the authorities issued a franchise for the construction of a gas works in North Yakima, Wash., announce that they have succeeded in raising the necessary capital ($50,000) and that active construction work will be soon underway.

THE Kerr Murray Manufacturing Company, of Fort Wayne, Ind., is under contract to reconstruct the scrubbing and condensing plant of the Bloomington (Ills.) Company.

THE proprietors of the Rome (N. Y.) Gas, Electric Light and Power Company have arranged for the construction of a telepherage system for the more economical carrying of heavy supplies to its generating stations.

THE Columbus (O.) Natural Gas Company has issued a blanket mortgage in the sum of $400,000. The Lima Trust Company is the Trustee.

THE franchise of the Penn's Grove Gas Company, which is to build a works for the supply of gas to the residents of Penn's Grove, N. J., specifies that the selling rate to ordinary consumers shall not exceed $1.50 per 1,000 cubic feet.

Coke Making as an Indian Industry.

The *Journal of Gas Lighting* says that one of the most important questions to be determined in connection with the scheme for working the iron deposits in the Central Provinces is the possibility of profitably coking the local supplies of coal. At the present time, owing to the small demand for metallurgical purposes, no more than 300,000 tons of coke are manufactured in India every year; and this is made in kilns, which not only produce an inferior coke, but do not recover any of the bye-products. In a recent issue of the "Records of the Geological Society of India," Mr. T. H. Ward, Assoc.M.Inst.C.E., the officiating Superintendent of the East Indian Railway Company's collieries at Giridih, examines the question whether it will pay to introduce modern methods of coke making into the coal field. The modern methods of coke making are of a two-fold character—there is the non-recovery process, where the chemical bye-products run to waste; and the recovery process, where they are extracted and prepared in a marketable form. Taking the non-recovery oven first, Mr. Ward claims that it would produce a greater yield of coke, with less ash, at one-third of the working charges now incurred.

The successful working of the recovery process is dependent upon two factors—the proportion of nitrogen in the coal and the price of sulphuric acid in Calcutta. Taking the latter point as favorably settled, and allowing for the recovery of 20 pounds of sulphate of ammonia per ton—an allowance Mr. Holland, the Director of the Survey, says is reasonable in view of the results of the assays—Mr. Ward shows that "recovery" ovens would prove highly remunerative, notwithstanding the considerable initial outlay. There is a strong demand for sulphate of ammonia as a fertilizer. Java alone imports some 24,000 tons a year, chiefly for the sugar plantations; and there is not the slightest doubt that the whole output from Indian coke ovens would be easily sold at highly remunerative prices. The profits on the tar extracted would also, Mr. Ward thinks, be much greater than that in England, because the whole of the tar and pitch used in India has to be imported.

[Report, as Furnished by the Secretary—Concluded from Page 287.]

PROCEEDINGS OF THE CONGRESS OF GAS ASSOCIATIONS OF AMERICA.

HELD IN LIBRARY HALL, HALL OF CONGRESS, LOUISIANA PURCHASE EXHIBITION, ST. LOUIS, MO., WEDNESDAY AND THURSDAY, JUNE 15 AND 16.

THURSDAY'S SESSION, JUNE 16.

STATION METERS.

[By Mr. Donald McDonald, of Albany, N.Y.—Concluded from page 287.]

The Drum.—The measuring drum is built on a turned steel shaft running in bronze boxes. To this shaft are fastened securely two or more cast iron drum centers. On these centers is built a drum frame of wrought iron with angle iron radial arms defining the position of the partitions and serving as spokes to channel iron bands encircling the drum. These are connected by truss and brace irons, and smaller irons are used as lattice braces to remove all buckle from the body or partitions, the whole construction being of a character best calculated to give durability to the drum and overcome the stresses consequent upon its rotation through the water. The body, partitions and hollow cover of the drum are made of heavily coated tin plates of the finest quality and carefully selected for freedom from untinned spots. These sheets are usually about 2 feet wide and 4 feet long, the usual weights being Nos. 16 and 18 B.W.G. These sheets are lapped about 1 inch at the seams and riveted together wtth tinned iron rivets and the joint thoroughly soldered and sweated through. Great care is taken to prevent leaks in the soldering and around such bolts as hold the body and partitions in place on the frame. The dry well is made of the same material as the drum body and placed in position after the drum is in the case. It rests in the dry well box and is held in place securely by its flange, which is fastened between the outer face of the flange and of the dry well box and the face of the flange of the inlet connecting elbow. In the larger meters manholes are provided in one or more of the partitions in the front or outlet end of the drum. These are provided with a cover fastened in place by cap screws and made tight with a leather gasket. Access to these manholes is afforded by a corresponding manhole in the front head of the case near the bottom. Drum plugs are provided in the body of the drum, access to which is afforded by a handhole in the top of the case. These plugs consist of a threaded socket soldered in the drum body and a threaded plug having a square head on the outside and made tight by a washer. The drum should be balanced carefully and revolve freely in the shaft bearing, care being exercised to see that it does not rub or touch any part of the case or dry well.

Appliances and Fittings.—On the front end of the shaft is a stud carrying the first of a line of gears running up to the secondary shaft which projects through a stuffing box to the outside of the case. These gears are sometimes on the outside of the head, sometimes in a gear sinkage in the registry box and covered by a plate, or, in the newer forms where the registry box is dispensed with, on the outside of the head and covered by a gear box. The secondary shaft and stuffing box should be above the waterline and the gears should be mounted on studs tapped with alternate right and left thread to prevent gears from unscrewing them. On the other end of the secondary shaft is a gear which meshes into the secondary line of gears running to the index box.

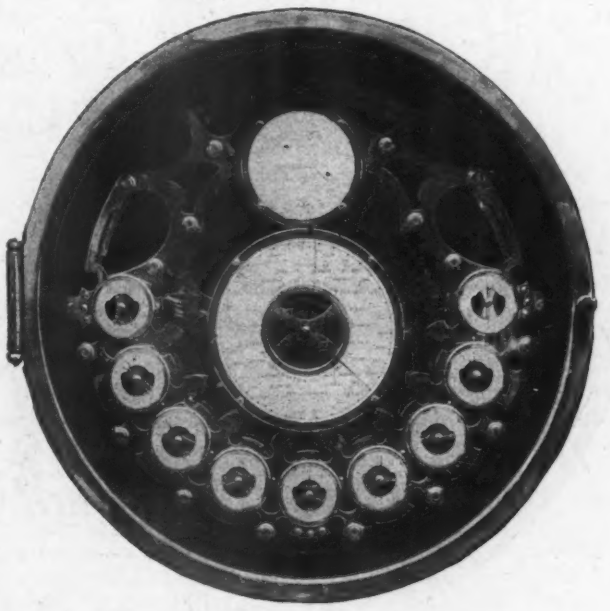
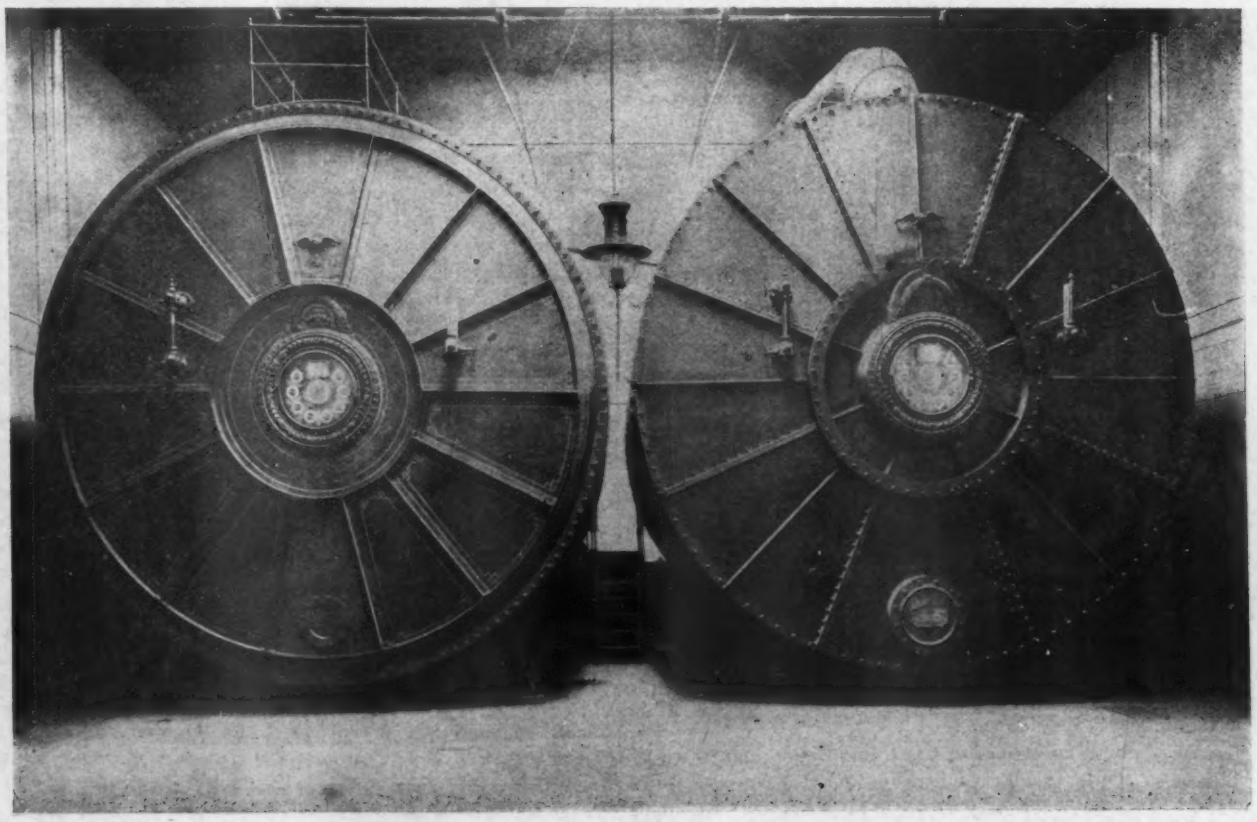


FIG. 14.
OPEN BAR INDEX WITH OBSERVATION DIAL.

The index is made in various forms, the most common being the crown form with the dials showing the registration arranged in a semi-circle and surrounding an ornamental design on a painted dial, or with



WROUGHT IRON CASE. FIG. 13. CAST IRON CASE.
Two of the three 18 ft. 6 in. meters at 91st St. Station, New York City. Photograph by courtesy of Consolidated Gas Co., N. Y.

the gears mounted in an open bar of ornamental design and having in the center a large dial showing the amount of gas passed per hour by observation of one minute. A newer form is the introduction of a so-called straight reading index showing the registration on the periphery of enameled rings.

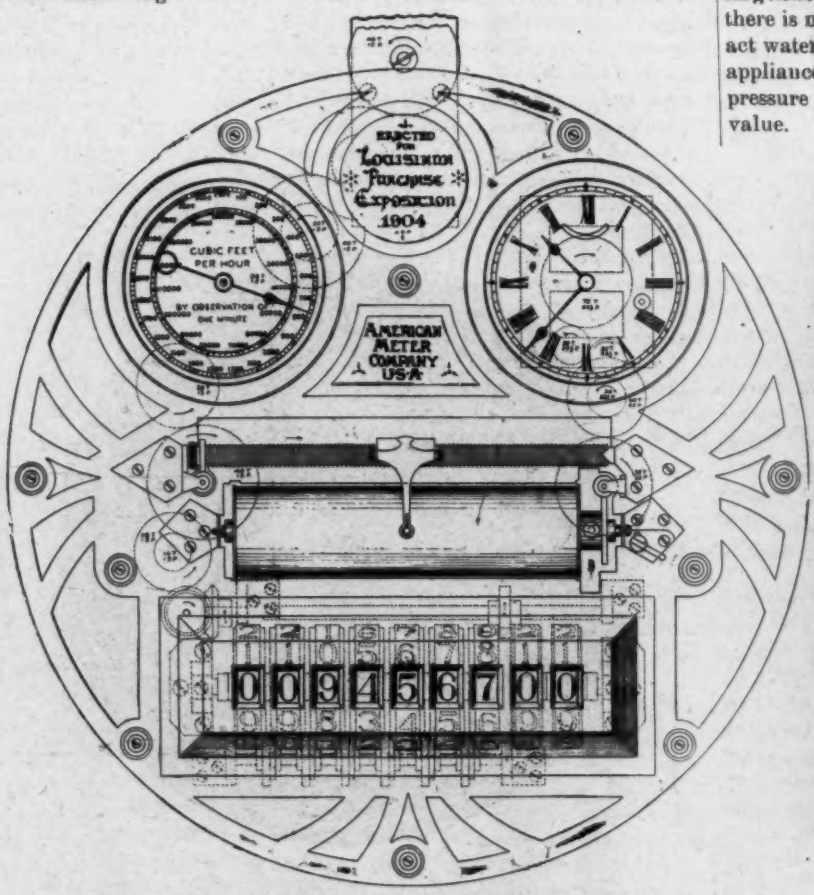


FIG. 15.—STATION METER INDEX WITH STRAIGHT READING REGISTER AND RECORDER. From a drawing.

A still newer form is one recently put on the market having a straight reading register and a tell-tale or recorder, consisting of a cylinder operated by a clock and carrying a paper chart showing the registration for 24 hours. The tell-tale occupies the center of the index, the straight reading device is below, and above is an observation dial, a clock showing time, and an ornamental name dial.

For many years it was the custom of the makers to furnish with a station meter 3 gauges, namely, an overflow gauge, which was usually mounted on the back head, a waterline gauge and a pressure gauge, which were mounted on the front head at the right and left of the index. The waterline gauge was of the usual pattern with two cocks and valves with a connecting glass tube, and with the meter shut down and the pressure off showed the height of the water. With the meter in action it presumably showed, if connected to inlet pressure at the top, the height of the water inside the drum, and if connected to outlet pressure, the height of the water between the drum and the case. The pressure gauge consisted of a cock or valve at the bottom with a single glass tube open at the top, and presumably showed outlet pressure. These gauges, while ornamental, have little value in actual use on account of the oscillation of the water in the tubes caused by the rotation of the drum. In modern practice both of these gauges are discarded and replaced with a differential pressure gauge, which is mounted on the front head of the meter at one side of the index and the overflow gauge is mounted on the other side. This gauge is made in several styles and sizes. Fig. 16 shows a form often used on the larger sizes of meters.

The gauge is mounted on the head in such a position that the zero on the scale is coincident with the water line of the meter. The cocks at the top are 3-way, and from one a connection to outlet pressure is made by a short pipe directly into the head of the meter, and from the other a connection to inlet pressure is made by a pipe running over the top of the meter to the inlet gas way at the back.

At the bottom there is a connection into the meter controlled by a valve. This is used only as a convenient method of supplying water to the gauge and is closed when the meter is in operation. A small draw-off cock is provided at the bottom, by means of which the height of the water in the tubes is adjusted should it chance that too much is admitted. The gauge when properly connected shows at all times inlet and outlet pressure and the difference or the amount consumed by the operation of the meter. By opening the large valve at the bottom the height of the water inside and outside of the drum will show in the large tubes, subject, of course, to the oscillation of the water, and when there is no pressure on the meter, opening this valve will show the exact water line that is being maintained. It can be made an attractive appliance, serving every possible purpose of the old water line and pressure gauges and giving besides information that is of practical value.

FIG. 16.—DIFFERENTIAL PRESSURE GAUGE.

On the small size of meters a modified form of this gauge is frequently used, having 4 glass tubes side by side with scales between and two cocks at the bottom admitting water from the meter. The form is essentially two siphon gauges with the pressure admitted at the top of the two outer tubes and showing the inlet pressure on the two tubes at one side and outlet pressure on the two tubes on the other side and the difference by observation of the height of the water in the two inner tubes. Such a gauge is shown on the meter in Fig. 12. It should be remembered that these gauges are on the meter to show the pressure and are used only incidentally and occasionally to show the waterline.

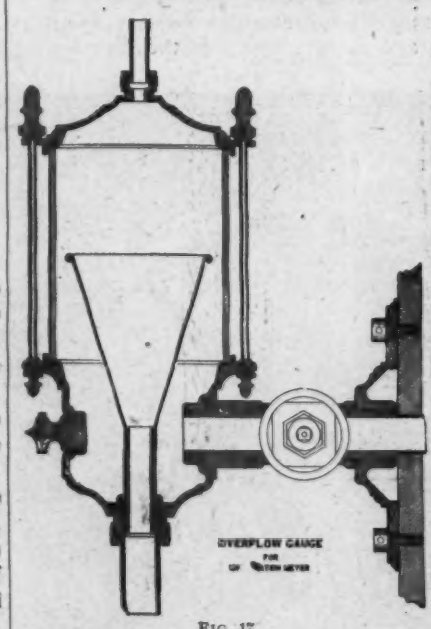


FIG. 17.

Fig. 17 shows an overflow gauge such as is generally used. The function of this gauge is to maintain the water inside the drum at the approved height.

It should be mounted on the front head of the meter and, if there is any preference, on the right-hand side, at such a height that with the water at the proved level the glass cylinder will be about one-half filled. The flare tube should have a running thread at the bottom allowing adjustment in height, and on account of capillarity should be set, in order to have the water overflow properly, with the upper edge of the flare just below the water line. It should be connected at the top so as to be affected by inlet pressure, which is most easily accomplished by running a pipe from it to the inlet elbow at the back of the meter. It should be trapped at the bottom either by a gooseneck formed of pipe, or by a seal box, so as to prevent the escape of the gas. The overflow gauge is automatic in its action in controlling the water line when used in connection with a proper water supply to the meter.

Fig. 18 shows a method of making water connections to the meter with a sight feed for maintaining the waterline and a sight discharge from the overflow.

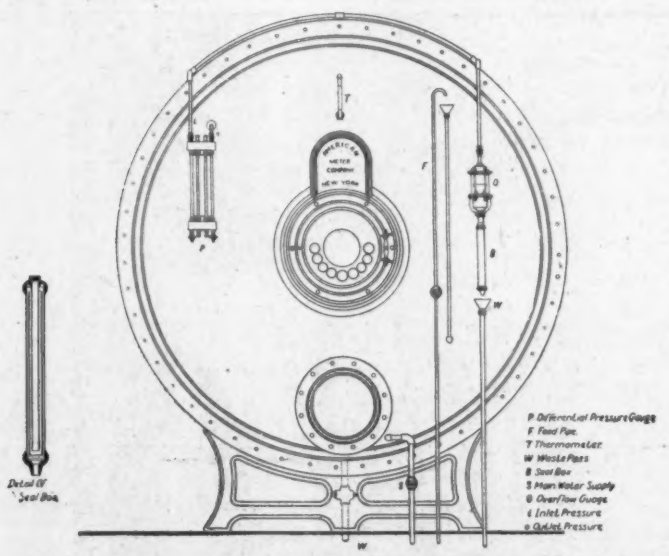


FIG. 18.—WATER CONNECTIONS WITH SIGHT FEED AND DISCHARGE AND GAS CONNECTION TO GAUGES.

By having these connections on the front of the meter the supply and discharge can be most conveniently controlled. A main water supply should be provided for the purpose of filling the meter with water, the connection for which should be made in the head of the meter near the lower edge and about 1 inch above the inside of the case. In larger meters it is also advisable to have a water connection in the opposite head in the same relative position. A main waste connection should be made in the center of the bottom of the case, the diameter of which should be the same as the plugs in the drum. By having a water connection at both ends with the waste in the center, the bottom of the case can be conveniently washed out from time to time.

On the larger size meters there should be, and usually is, provided a device for oiling the bearings. This is done by small pipes leading from the shaft boxes to the outside of the case, either on the top of the body near the flange on the heads, or coming through the case and piped high enough to give the oil sufficient head to force it through the water. The pipe is furnished at the top with a cap or with a cock and an oil cup.

Another and perhaps a preferable method of lubricating the bearing is by the use of lubricating grease, which, by means of a compression cup, is forced through a pipe leading from the outside of the case to the shaft bearing.

Operation and Care.—Having described the various parts of the meter we must next turn to its subsequent operation and care.

The meter should be located in a well lighted and well ventilated place in which the temperature can be maintained in cold weather well above the freezing point. There should be in all cases sufficient space in front of the meter to allow the removal of the drum should this be necessary for examination or repair. It should be placed on a solid foundation and stand level and firm. Care should be taken in making the gas connections to have them rigid and well fitting so as not to put any stress on the meter head. Before making the inlet connection the dry well should be examined to see that it is properly in place, and at the same time the drum should be given a few turns to see that it revolves easily.

With the large sizes erected *in situ* the makers are, of course, responsible for the correct placing of the meter, and in placing the smaller sizes the engineer in charge should see that it is level from back to front by running a level across the top of the head flanges, and from right to left by leveling along the marked waterline on the front head. After the gas connections are made the gauges should be put on and the water connections made. The index should be carefully put in place and the gearing tried to see that it meshes properly and runs smoothly. The hand-hole plate on the top of the meter should be removed and the drum plugs taken out and the meter filled with water to the marked waterline. The removal of the drum plugs allows the water to fill the drum and case simultaneously, obviating any undue stress on the drum. The plugs should be replaced before the water rises to such a height as will seal the partitions, or, say, about 6 inches below the waterline, as the drum can be more easily revolved with the partitions unsealed. After replacing the plugs, being sure that they are gas tight, the hand-hole plate is replaced and the meter is ready for operation.

Once set up properly the station meter requires but little attention, but it should not be neglected. With the surroundings neat and clean, and the meter case kept well painted and the fittings polished occasionally, the station meter becomes, and it should be, one of the pieces of show apparatus in the works. With a small amount of water feeding into the meter continuously and the overflow working properly, the water in the meter will be kept fresh and comparatively clean. Some sediment will inevitably collect in the bottom of the case and this should be cleaned out from time to time, the frequency depending upon conditions. With large meters it is advisable to examine the drum occasionally—in some works this is done every summer; but in doing this the meter should not be kept open and the drum exposed to the action of the atmosphere any more than is absolutely necessary. The bearings in large meters should be kept oiled. In small meters this is not so essential, and where oiling tubes are not provided the bearings can be lubricated by lowering the waterline below the center of the meter and running some oil in on top of the water. The index and secondary gear should be oiled occasionally, and it is well to use clock oil for this purpose, as it will not gum up. The stuffing box through which the secondary shaft projects should be repacked with oiled yarn occasionally, although the necessity for this will be found to be infrequent if it is properly packed.

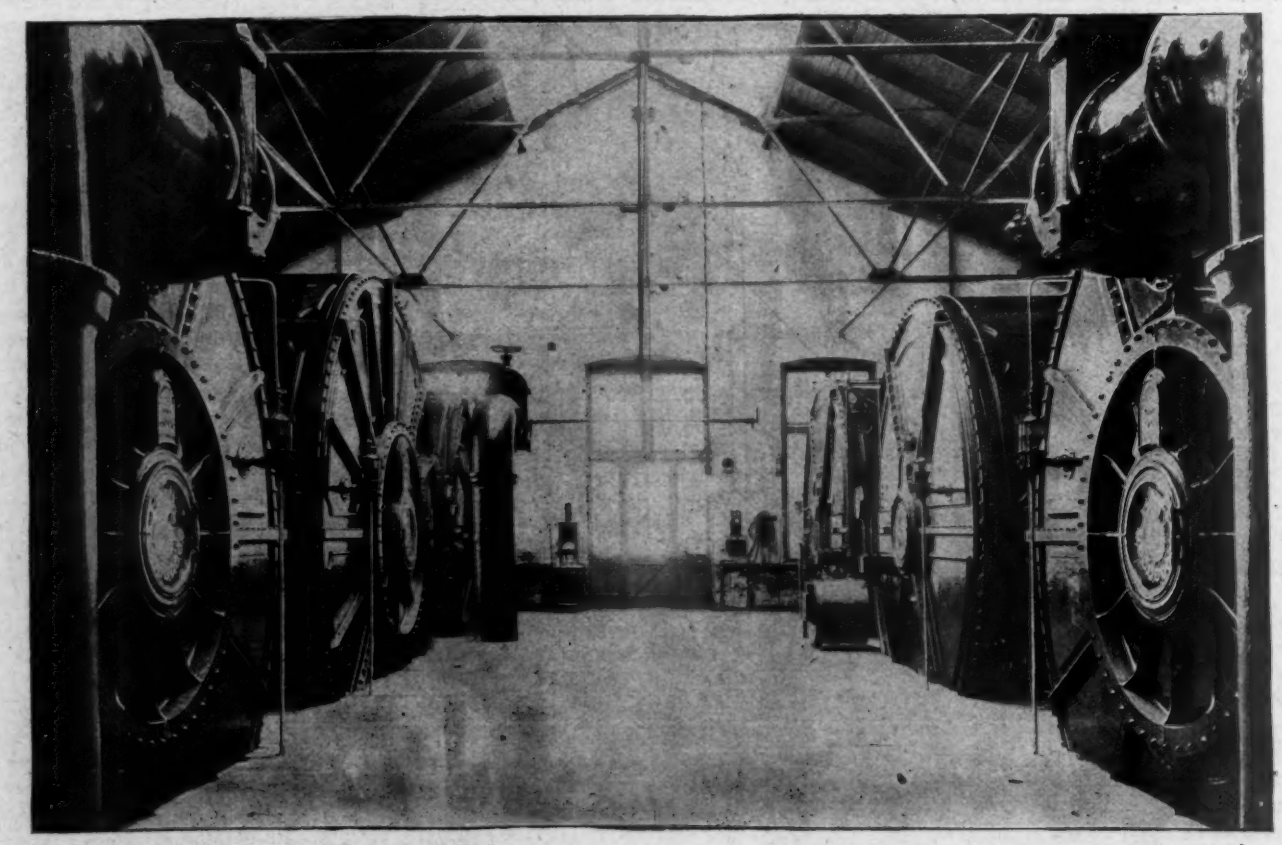
An interesting phase of this part of the subject is the question of capacity. King states that "The capacity of the station meter is reckoned by the quantity of gas it is capable of passing in an hour, the wheel making 120 revolutions in that time;" and in a more recent English publication it is stated that "The capacity per revolution of a station meter is generally one-hundredth of its rate per hour." Neither of these statements is correct either in theory or practice. The capacity of a station meter should be based on the capacity of the drum per revolution, multiplied by the number of revolutions it will make per hour at a given loss of pressure. Elsewhere in this paper it is stated that the speed of a drum seems to be limited by practical considerations only. These limitations are a due regard for the working life of the drum, and the amount of absorbed pressure which it is desirable to allow for the operation of the meter.

Other conditions being equal, the working life of a drum depends, no doubt, on the speed at which it is driven through the water, and the makers have adopted, therefore, as a basis in rating the different sizes, a given circumferential speed in inches per second, as, for instance, about 7 inches per second for the old Crosley 4-partition tppe, 8 inches for the Parkinson 3-partition type and 12 inches for the Hinman type. It has been found, leaving the axle friction out of consideration, that drums of varying but relative dimensions will produce a constant loss of pressure at a given periphery speed, and the various types are usually rated, therefore, at 1 inch loss, which is about the absorption when run at the above speed. This loss is, moreover, about all that can be afforded, especially in small works, and while probably no harm will result from running the meter at a greater speed than this, and especially for a short time, yet to set this as the ordinary limit will certainly conduce to a longer life and a smaller maintenance charge.

On page 35 is a table of the various sizes of meters ordinarily made, with the usual rated capacity at 1 inch loss of pressure between inlet and outlet. To this table is added also the weight of each size and of the water, and the writer should add that the figures of capacity are intentionally conservative and that the weights are necessarily approximate.

A word might be said at this point about the usual position of the outlet gas way. Ordinarily this has been at the back of the case, and the gas escaping from the drum at the front end must pass over the drum between it and the case to the outlet. By placing the outlet on the front head the gas escapes directly into it as it leaves the drum, with a consequent saving in loss of pressure. With the outlet in this position the drum can also be made larger both in diameter and length, as it is not necessary to utilize as gas way the space between the drum and the case, and thus a greater capacity is obtained without an increase in periphery speed. While this position of the outlet detracts somewhat from the appearance of the meter, especially the smaller sizes, it does not particularly affect the appearance of larger meters. A view is given in Fig. 19 of three 16-foot meters with outlets connected in front, this picture being otherwise interesting as showing one of the largest installations of meters in one room in this country, the aggregate capacity of the 6 meters being about 1,000,000 cubic feet per hour.

Testing.—Before the meter is delivered to the purchaser by the maker it is tested, the exact water line is established and marked and the index is geared to register correctly. The meter is tested with two purposes in view. First, for soundness, or the detection of leaks if any exist in the drum or case; and, second, to prove that the meter holds a given



16 ft. Meter. Hinman Drum. Front outlet. | 18 ft. Meter. 4 partition Drum. | 16 ft. Meter. Hinman Drum. Front outlet. | 16 ft. Meter. 3 partition Drum. | 16 ft. Meter. 4 partition Drum. | 16 ft. Meter. Hinman Drum. Front outlet.

FIG. 19.—METERS AT RAVENSWOOD (L. I.) STATION. Photograph by Courtesy New Amsterdam Gas Co.

Size.	Capacity per Hour in Cubic Feet with 1 Inch Loss.		Capacity per 24 Hours in Cubic Feet with 1 Inch Loss.		Usual Size of Connections.	Weight of Meter.	Weight of Water.	Weight of Meter and Water.
	Parkinson.	Hinman.	Parkinson.	Hinman.				
4 feet	5,200	8,000	124,800	192,000	8-inch	3,800	2,200	6,000
4 feet 6 inches	6,800	11,250	163,200	270,000	8 "	4,950	3,100	8,050
5 feet	8,500	14,500	204,000	348,000	8 "	5,950	4,200	10,150
5 feet 6 inches	10,400	18,000	249,600	432,000	10 "	7,450	5,650	13,100
6 feet	12,400	21,750	297,600	552,000	10 "	8,750	7,350	16,100
6 feet 6 inches	14,700	25,750	352,800	618,000	12 "	10,500	9,300	19,800
7 feet	17,100	30,000	410,400	720,000	12 "	12,250	11,500	23,750
7 feet 6 inches	19,800	35,000	475,200	840,000	12 "	14,350	14,000	28,350
8 feet	22,500	40,000	540,000	960,000	12 "	16,600	17,250	33,850
9 feet	28,800	51,000	691,200	1,224,000	16 "	24,000	24,500	48,500
10 feet	36,000	63,000	864,000	1,512,000	16 "	29,500	33,500	63,000
11 feet	44,000	77,000	1,056,000	1,848,000	16 "	36,000	44,200	80,200
12 feet	53,000	92,000	1,272,000	2,208,000	16 "	44,500	57,500	102,000
13 feet	63,000	109,000	1,512,000	2,616,000	20 "	54,000	73,300	127,300
14 feet	74,000	128,000	1,776,000	3,072,000	24 "	66,000	91,500	157,500
15 feet	86,500	150,000	2,076,000	3,600,000	24 "	80,000	112,500	192,500
16 feet	100,000	173,000	2,400,000	4,152,000	24 "	95,000	136,000	231,000

amount per revolution at an exact water line and that the index is geared correctly.

The test should be made with a wet test meter, which should be carefully proved to be correct at a given rate of speed. In making the test the gas is passed, first, through the test meter and then through the station meter, the general arrangement of connections being as shown in Fig. 20. The main inlet and the outlet valves to the station meter should be tightly closed, and as a matter of precaution should be sealed with water if possible. The supply of gas to the test meter should be from a source having the least possible variation of pressure.

Pressure gauges should be fixed so as to show the inlet and outlet pressure on both the test meter and the station meter, observation of which will indicate any undue resistance in either meter and furnish a basis for any necessary correction in the test on account of the drop in pressure between the meters.

A thermometer should be fixed in the front head of both meters, indicating the temperature of the passing gas.

In testing for soundness of the station meter case and the testing connections, the valve in the discharge pipe from the station meter is closed, the other valves being wide open. When pressure has accumulated on both meters, the valve in the supply to the test meter is closed and an observation of the pressure gauges made to see if the pressure holds. If it does not hold, a leak is indicated.

As a general rule, a leak in the case will be indicated by the station meter drum revolving slightly during the falling of the pressure, while it will remain stationary for a leak in the testing connections. Having ascertained that the case and connections are tight the test is proceeded with to prove the soundness of the drum and for the establishment of an exact waterline. A long hand or pointer is fixed on the secondary spindle of the station meter by means of which the revolutions of the drum are indicated precisely. The valves controlling the supply to the test meter and the value in the discharge to the open air are opened to such a degree as will speed the test meter at the proper rate and hold the pressure steadily, and one or more revolutions made of the station meter drum.

The soundness of the drum is determined incidentally by the test made for the establishment of the waterline. The capacity of the drum is usually known, either by calculation of its dimensions or by previous experience, or both, and any decided increase in this amount would indicate a leak in the drum. In addition to this the action of the

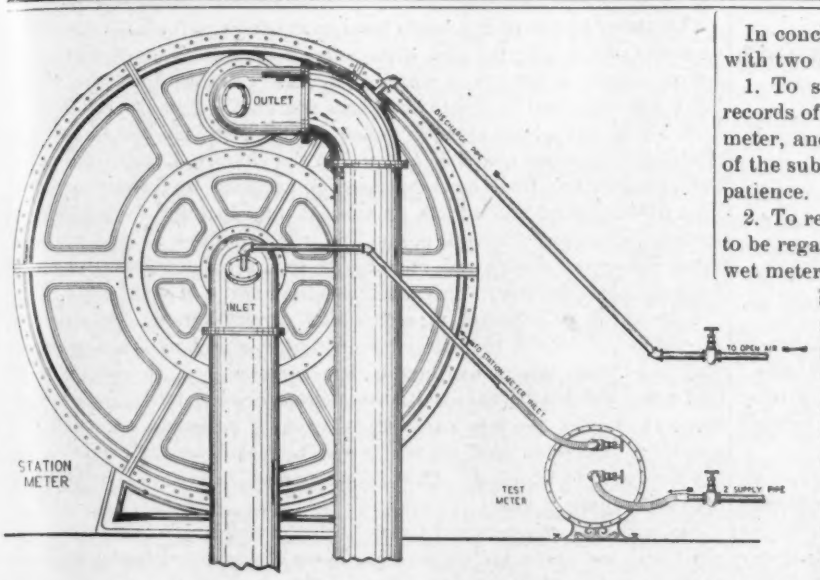


FIG. 20.—CONNECTIONS FOR TESTING WITH WET TEST METER.

pointer on the secondary spindle should be observed at all times during the test. While the waterline should be finally fixed as the result of tests made at the speed at which the test meter is proved correct, one or more complete revolutions of the drum should be made at a slower speed. If the results agree of tests made at verying speeds, the drum is undoubtedly sound. After the waterline is established the index is geared to register correctly the gas passed at each revolution of the drum, and the accuracy of the gearing leading to the index should be determined either by counting the teeth in the gears, or by one or more revolutions of the drum after the index is fixed in place.

It would be an ideal situation in making a test of a station meter, if the temperature of the room, of the water in both meters and of the gas were all uniform, and any ordinary means that can be taken to provide these conditions should not be neglected. These ideal conditions are seldom possible, however, and, therefore, in order to obtain accurate results, the tests as made must usually be corrected for variations of temperature. These corrections should be based on observations of the temperature of the gas as it leaves the drum of the test meter and the drum of the station meter, or, in other words, from the thermometer fixed in the front head of both meters, and the correction should be made according to the standard correction tables. A further correction should be made for the drop in pressure which occurs between the test meter and the station meter, and due to friction in both meters and in the connections. This drop is usually small, but should be taken into consideration, and the correction should be based on observations of the pressure shown by the gauges on the inlet of both meters.

While the above remarks apply more particularly to the original testing of a station meter, they apply also in a general way to the subsequent testing which may be made to determine the continued soundness of the drum and to verify the accuracy of the registration of the meter.

Sometimes it is necessary to change the relative position of the test meter to the station meter. This becomes necessary when it is impossible to close and seal tightly the inlet valve to the meter, which is sometimes the case with old valves. Under these conditions the gas is passed through the station meter first and then through the test meter. One of the principal objections to this method of testing is the probable variation of pressure during the test, due to the fact that the station meter is subject to every change of pressure on the works, making it necessary to take very careful observations of pressure in order to make close corrections.

Occasionally it is desirable to have the meter register in other terms than actual cubic feet measured; for instance, the gas may be passing the station meter under an average pressure of 10 inches water column, while the registration is desired in terms of an average pressure of 1½ inches. This is easily arranged, but should always be calculated mathematically, and then by producing the desired difference in conditions between the station meter and the test meter, proved out experimentally.

It should be borne in mind, however, that the station meter measures volume and that, correctly proved, it will register a cubic foot of gas for every foot passed under whatever conditions of temperature and pressure prevail in the meter, and that to obtain the volume at some other temperature or pressure the necessary corrections must be carefully made, based on a knowledge of the prevailing conditions.

In conclusion the writer begs to say that this paper was undertaken with two objects in view.

1. To supply, to some extent at least, an apparent lack in the records of the Association of information on the subject of the station meter, and iu carrying out this idea the writer has gone into the detail of the subject as far as seemed possible without presuming upon your patience.

2. To remove some of the mystery with which the station meter seems to be regarded, especially in smaller works. That the geometrics of the wet meter are somewhat difficult to describe and thoroughly understand is true; that it requires skill and experience, and above all, care, to properly design and construct the form of wet meter known as the station meter, is no less true, but the writer hopes that this paper may aid in giving snch general knowledge of the principle involved in the wet meter and of its design and construction that it will no longer be regarded as a mystery.

King states that the station meter may be classed among the most beautiful of mechanical inventions, and this, while high praise, is not unwarranted. Not the least of its claims to such a high place is its simplicity of operation while assuring the absolute correctness of the result of the work it is designed to do.

The writer desires to acknowledge his indebtedness for assistance in preparing this paper to Mr. L. M. Schofield, C.E., of Albany, N. Y.; to Mr. Chas. W. Hinman, M.E., of Boston, Mass., late Inspector of Gas and Meters, of Massachusetts, and to Mr. Wm. N. Milsted, of New York, Secretary of the American Meter Company.

The President (Mr. Pratt)—As the hour for adjournment is already at hand, I think, with Mr. McDonald's consent, we will not call for any discussion on his paper.

Mr. McDonald—I will be glad to answer any questions as briefly as I can.

Mr. J. B. Howard (Galena, Ills.)—I move a vote of thanks to Mr. McDonald for the excellent paper which he presented.

Mr. A. S. Miller, Baltimore, Md.—In seconding the motion for a vote of thanks to Mr. McDonald, I wish to say I do not believe there are many people connected with the gas industry of this country who know of the part that Mr. Donald McDonald, of Albany, has had in developing the station meter. It is perfectly true that this is Mr. Hinman's drum, but it is also true that the strength of the meter depends in a large degree on the way in which the drum is framed up, and the frame is almost as important as the design of the drum, even more important, and Mr. McDonald has had a great deal to do with the development of the frame of the meter drum. If any of the gas people would compare the drum of 10 years ago with the drum of to-day they would find there has been more advance made in this respect than has been made in steam locomotives in the past 30 years.

The President (Mr. Pratt)—Before putting the motion I will say that if any of the gentlemen have prepared written discussions on this paper they may hand them to the Secretary, so that they may be embodied in the proceedings. [Mr. Howard's motion was put and carried.]

The President (Mr. Pratt)—I will turn the meeting over to the President of the American Gas Light Association, Mr. Norris.

The President (Mr. Norris)—We have now reached the closing stage of the Congress.

THANKS.

Mr. Doty, St. Paul, Minn.—Before we adjourn, I would like to say that this Gas Congress has been unique in its opportunities, and its records will be epoch making. We who have been in attendance know that the programme of a Congress of this character does not simply happen—there must be directing forces and directing energies. I think, therefore, Mr. Chairman, it will be proper, and with your permission I will move that a vote of thanks be tendered to the Committee of Arrangements who have so generously provided for our entertainment and for our comfort, and I include in my motion that the members of the Congress thank the officers of the Congress who have prepared such a splendid literary programme for our education. [Adopted.]

The President (Mr. Norris)—The Committee of Arrangements will please consider itself heartily thanked by the Congress and the officers of the Congress will also consider themselves similarly thanked. I would like to make a motion from the rostrum, if I may, to move a vote of thanks to the Secretary of this meeting. He has had a lot of work to do, which no one who has not been called upon to get up a similar meeting will be able to appreciate. I move the vote of thanks separately to Mr. Forstall, in addition to Mr. Doty's motion.

Mr. Wm. McDonald, Albany, N. Y.—I heartily second the motion, as I know what the Secretary's work has been in connection with this Congress. [Adopted.]

The President (Mr. Norris)—The Secretary will consider himself thanked. Before a motion for adjournment is made, I desire in the name of the respective presiding officers of this Congress to express my appreciation of the attendance of the members and the manner in which the Congress has taken hold of the subjects which have been presented. It has been very satisfactory and thoroughly appreciated by those who have been in the chair.

On motion the Congress was declared adjourned.

[Continued from Page 291.]

TWELFTH ANNUAL MEETING, PACIFIC COAST GAS ASSOCIATION.

HELD IN MECHANICS INSTITUTE, SAN FRANCISCO, CAL., JULY 19 AND 20, 1904.

FIRST DAY—JULY 19—AFTERNOON SESSION.

The meeting was reconvened at 2 P.M. The Secretary having read a communication from the Mechanics Institute, the President introduced Mr. E. C. Jones, who read the following paper on

PRESSURE POINTS.

When the Pacific Coast Gas Association was formed, it took for its emblem a circle of pipe, which suggested the motto, "No Dead Ends." This was adopted as an ideal condition of gas distribution, but at that time it was thought hardly possible that such condition would be realized in a few years.

The best system of what is known as low pressure distribution, with cast iron mains and large feeding mains reaching out from the storage holders, does not and cannot meet the requirements of the ordinary gas consumer for satisfactory service. The initial pressure is constantly changing as the storage holders are raised or lowered, and the "peaks" of demand for gas are supplied by "valleys" of pressure. No matter how well arranged the system of piping may be, there is always a difference between the initial and terminal pressures in the district, and as the demand for gas increases, this difference becomes more pronounced.

Owing in a large measure to the successful introduction of incandescent electric lighting, gas has been forced to find a new field in order to keep up the proverbial increase of doubling the output every 10 years. This new field has been in the line of cooking and heating, and the business of cooking and water heating has brought about 3 new "peaks" in the delivery of gas, during the preparation of breakfast, luncheon and dinner, and at the same time the burner units for using gas have increased in size many times.

These "peaks" require special handling in order to give satisfactory service, because the Bunsen burner used for cooking and heating must be so arranged for economy and efficiency that the gas and air are rightly proportioned, and it is evident that in order to accomplish this, the pressure of the gas must be exactly uniform. This can only be done by an individual pressure regulator at each consumer's meter, and the maintenance of pressure at the inlet of the regulater at all times greater than the outlet pressure for which the regulator is set.

For instance, 4 inches of pressure (water column) seems to be a satisfactory pressure for the operation of any gas appliance having Bunsen burners, so that all house regulators would be set to deliver the gas at the outlet at 4 inches pressure.

In order to be assured that this necessary pressure will be constantly maintained, it is essential that the street main pressure shall be kept at a point high enough to insure sufficient storage of pressure against sudden demands for gas. This cannot be done by ordinary street main systems, fed by gasholders which are diminishing in pressure as the demand increases, or on long stretches of small pipe where the consumers are severely trying the capacity of delivery of gas at any pressure at the farthest end.

High pressure distribution has come to our relief, but it came into the field like a whirlwind, and the gas men of the country began to consider the distribution of gas at pressures of from 25 to 300 pounds to the square inch. After much experience, that whirlwind of ideas has been harnessed and refined so that now its application is adapted to the existing needs.

Say if it is desired to supply a town or a chain of towns at a distance from a central gas making point, it is first necessary to make a careful estimate of relative initial cost and operating expenses between various sizes of pipe and the initial pressure necessary to deliver the required quantity of gas with ample margin for growth. This leads the engineer into a mass of calculations, with the result that he is astonished at the large amounts of gas which can be forced through long lengths of 2-inch pipe at moderate pressures, and the increase of business is provided for by the ability to increase the initial pressure up to the economical limit of single stage compression, say, 80 pounds per square inch. An installation of this character requires good workmanship and material. The pipe should be carefully tested, thoroughly protected against corrosion, and should be what is known as "plain end," with no screw joints. Each joint should be made with some approved form of coupler, using rubber gaskets, which are jammed down so that only a feather edge of rubber is exposed to the action of the gas.

The use of a joint of this kind, besides insuring tightness, obviates the necessity of touching the pipe with tongs or other tools, so that the protective coating is not in any way injured, for it is almost as harmful to lay a pipe uncoated as it is to have bare spots on each length of pipe.

In laying out a high pressure system of this kind it is best to first install the compressor complete and to run the pipe from the compressor, testing each day's work by compressed air supplied by the compressor. This will be found much more convenient than testing the pipe in small sections by means of a hand pump, and it is sometimes helpful to use a small amount of ether at the compressor, so that the compressed air will have a noticeable odor. This facilitates the finding of small leaks.

After the installation of pipe line and compressors is completed it should be the duty of the gas engineer to determine how low a pressure may be carried, rather than how high a pressure can be carried, and this study will lead to the installation of compression tanks for storage along the line of the pipe, and a gradation of pressures regulated by district governors to meet the requirements of each separate portion of the district to be supplied. This is for economy, safety and assurance of constant supply of gas.

In California, the towns of Grass Valley and Nevada City are supplied with gas under high pressure. These towns are situated 4½ miles apart and the high pressure pipe line connecting them is of 2-inch wrought iron pipe with screw joints. The pipe is well protected and shows no sign of leakage. The gas is made at Grass Valley and is stored in compression tanks at a pressure of 80 pounds per square inch, while the compressor is operated by a gas engine, so that the cost of compression may be easily determined.

The pressure is reduced to 20 pounds by means of a district governor, and this pressure is maintained throughout the transmission line to a point where the transmission line joins with the distributing system of each town, where it is reduced to 15 pounds. Every meter is provided with a separate pressure regulator, as above described.

Another instance of high pressure distribution is in the town of Petaluma, which is connected with Santa Rosa by a 2-inch pipe line 16.8 miles long. The gas is made at Santa Rosa and is compressed and forced to Petaluma at pressures to meet the demands of the consumers, which at present are as follows:

6:30 A.M. to 8:00 A.M.	25	pounds.
8:00 A.M. to 10:00 A.M.	15	"
10:00 A.M. to 11:30 A.M.	40	"
11:30 A.M. to 4:00 P.M.	15	"
4:00 P.M. to 6:00 P.M.	30	"
6:00 P.M. to 6:00 A.M.	10	"

The distributing system of Petaluma is of small sized steel pipe and the gas is distributed under high pressure in a manner similar to that employed at Grass Valley and Nevada City.

The town of San Mateo is also supplied under high pressure through 2½-inch pipe line, something over 8 miles long, from Redwood City.

Aside from the advantages of high pressure distribution of gas in small cities and between cities, high pressure fills the need of a larger field, and one of growing importance, in "boosting" the pressure in cities where the low pressure distribution system consists of small mains with numerous dead ends; whereas, without the help of high pressure, these distributing systems would have to be condemned and replaced by a modern system.

One of the best examples of this system in practice may be found in the city of Fresno, which is piped with small mains, and as the city has rapidly grown these mains have been extended in all directions until it became a problem to maintain any pressure and supply of gas at extreme points. At the same time this city was rapidly growing in two directions in what is known as additions, and these additions were built up with a good class of houses, requiring gas for cooking and heating. To save the old distributing system and supply gas to these additions, a 2-inch loop was laid completely around the city from the gas works back to the gas works, again, and at the principal dead ends of the old low pressure system connections were made with the high pressure loop, using a district governor to reduce the pressure to 4-inch water column.

This arrangement equalizes the pressure at every point in that city, and should an accident happen to any of the district governors, by the breaking of a diaphragm or otherwise throwing the high pressure directly into the low pressure mains, the gasholders at the works act as safety valves to keep the pressure down to a point where no damage can be done to ordinary tin gas meters or fittings designed for low pressure.

This emergency has never arisen, but the safeguard stands ready at all times. From this 2-inch loop high pressure wrought iron mains

lead out into the additions and the houses are connected by ½-inch services and governors at the meter, so that the city of Fresno is supplied by a combination system, the same loop reinforcing the low pressure district and supplying a high pressure district. The initial pressure on the loop at the gas works is 15 pounds per square inch.

A resume of personal experience with high pressure installation has demonstrated the importance of the following points: Always provide duplicate compressors. Never depend upon a source of power which will fail, unless another means is at hand. This is particularly important where a gas compressor is operated by an electric motor, for should the electric current fail at any time, the gas consumption immediately increases, usually 2-fold, for the reason that gas is then used for lighting to take the place of electricity. Unless there is a residual which supplies cheap boiler fuel, gas engine power is the most reliable and satisfactory for running compressors.

If the capacity of the transmission line will not store gas enough under pressure to supply the consumption for 30 minutes, use compression tanks. In any event, the use of compression tanks is in the line of economy, because the tanks may be located above ground, are easily accessible, perfectly gas tight, and as the compressor works at a constant speed and pressure into the tank or tanks, the pressure at the outlet of the tanks may be governed to any desired point. A reliable check valve should be placed in the line of pipe between the gas compressor and the compression tanks to prevent the gas from blowing back in the event of an accident to the compressor.

In laying pipe, each length of pipe should be stood on end and all scale and dirt hammered out of it. All pipes should be carefully examined for splits before being painted with two coats of red lead mixed with the best boiled linseed oil.

Should it be thought desirable to make use of screw joints, every joint should be made with line pipe sockets, or other fittings having taper threads to correspond with the taper of the ordinary threads on the end of the pipe. Sockets and other fittings ordinarily used have a straight thread tapped from one end and entirely without taper.

Pipe should be made up one length at a time, and the pipe should be graded to take care of drippage the same as with low pressure piping, but in the place of drips, outlets with lock stopcocks are substituted. This is important because the whole or portions of the system may be without pressure in cases of emergency, when water may leak into the pipe from the outside, or the pipe line may become flooded with water during process of construction, and there are many other reasons why it is desirable to give some thought to the proper grading of the pipe, although it is not nearly so vital as in low pressure gas distribution, because any accumulation of liquid may be easily blown out of the pipe line, and it is never necessary to use a pump.

In calculating the size of pipe necessary, always err on the right side by making the pipes amply large. For instance, a 1½-inch pipe is more than twice as large as a 1-inch pipe, while the price is not twice as much, and the 1½-inch pipe is much stronger and capable of resisting strains from outside.

The special couplers for connecting pipe provide for expansion and contraction, but should line pipe sockets be used in their place it has been found of advantage to lay the pipe in a sinuous line in the trench.

Finally, the advantages to be derived from compressing gas must not be overlooked, and it is a question worthy of discussion whether it is not advisable and economical to subject all illuminatihg gas to the physical change which takes place during compression, on account of the condensing and cleansing effect on the gas.

It is well known that the candle power of gas is not affected by raising the pressure to about 20 pounds, on account of the taking out of water up to that point which would otherwise reduce the heating value of the gas, and at pressures over 20 pounds any loss in candle power which, at the most, is almost negligible, is due to the removal of un stable hydrocarbons which would better be removed at the works.

The effects produced in compressing gas by de-hydrating it and condensing out particles of dust, lampblack, or unstable hydrocarbon vapors, greatly improve the service on high pressure distributing systems, where stoppages by water, naphthaline or dust are unknown. In fact, the advantages of compressed gas are so apparent that all consumers appreciate them and draw comparisons between old and new methods, aud it has been the experience at Fresno that low pressure consumers have asked to be placed on high pressure mains.

This brief description of high pressure gas distribution as it exists in California is hardly worthy to be dignified with the title "paper," but it is hoped that there may be some hints contained in it which will be of use to the members who are workers in this field.

Discussion.

The President—This is another of the many practical and valuable papers with which we have been favored from time to time by Mr. Jones. I will call on Mr. Colquhoun to open the discussion.

Mr. Colquhoun—This subject is very well covered in Mr. Jones's paper. We have, as Mr. Jones said, a system different from any other in use. We are serving about 300 consumers from our high pressure mains and also boosting up our low pressure mains. The experience we have had is ideal. The consumers are very much better served and are much better pleased. The main trouble we have had is that the consumers have had too much gas. I think one should look out for grading his pipes. We have had some water for some cause or another; if we had not graded the pipes I think we should have had more or less trouble. Ours are graded in the same way as low pressure pipes, though perhaps not quite so much. We put in drips about 1,000 feet from our compressor to catch any condensation. There is no trouble beyond if it is taken out there. Another thing to be taken care of is to put a safety pipe on each governor in case of a break so as not to extend the pressure beyond the meter. Otherwise it is an ideal system.

Mr. Britton—This paper is largely educational. I imagine most of the gas men have had no experience in high pressure distribution systems, and questions may enter their minds as to its applicability to any low pressure system. Perhaps it might be just as well to say right here some little things Mr. Jones has purposely omitted for fear of making the paper too long. The high pressure system in any phase (even calling 1 pound or 1½ pounds high pressure, as against what would be commonly regarded as such) can be used at any time for the building up of low pressure mains anywhere, either by a trunk line of high pressure feeding into the low pressure, or by pumping directly into the mains to the extent that they will stand it. I presume some mains would not stand over 1 or 2 pounds without enormous loss by leakage, but a majority of the cast iron mains will stand up to 8 or 10 pounds without serious loss. One factor in connection with distribution by high pressure is the absolute necessity of providing pipes at the intake and outlet of the compressor of large enough size to take care of the surge that will sometimes occur. If your outlet pipe is 3 inches and your inlet 3 inches you cannot draw to the extent of the capacity of your compressor. I would like to ask Mr. Colquhoun what his experience in that respect has been—what he found it necessary to do as to the inlet and outlet pipes?

Mr. Colquhoun—When we first connected we had a 4-inch inlet. It was not very satisfactory. Afterwards we put in a steel cylinder 42 inches in diameter and 22 feet long and connected directly from the outlet of the holder to the cylinder. A small pipe is not good. I do not think you can get too large an inlet pipe.

The President—We would like to hear from Mr. Grover.

Mr. Grover—I think you are rather imprudent in calling on me for I have not had much experience in this line. High pressure was new to me when I came from the East, but I have had an opportunity of examining all the systems Mr. Jones spoke of in his paper. The most interesting point to me about it is the practicability of running a gas compressor with a gas engine; that I think should be strongly brought out. We made some observations as to the amount of gas necessary to compress a given quantity and found that about 10 per cent. of the amount of gas compressed is required for the gas engine. Most of these observations were made on the gas engine at Grass Valley, which is operated at an elevation of over 2,000 feet. Gas engine builders declare that a rise of 1,000 feet destroys the efficiency about 5 per cent. In other words, we should be losing about 10 per cent. of the efficiency of this gas engine. When I was last in Grass Valley we made a trial on the compression tanks, and succeeded without any difficulty at all in running the pressure up to 100 pounds with this gas engine, and the rating of the gas engine is very close to the factor of safety for the compressor. The compressor, according to the builders, requires every bit of the horse power at which the gas engine is rated.

Mr. Lowe—For what pressure is the compressor built? Will it do more than 100 pounds?

Mr. Grover—I did not try to run it any higher than that.

Mr. Jones—It is an 80-pound compressor.

Mr. Lowe—Were you then using all the power of your engine?

Mr. Grover—I think we were.

Mr. Lowe—What is the horse power of your engine?

Mr. Grover—It is rated at 38.

Mr. Lowe—And how rapidly were you compressing your gas?

Mr. Grover—I cannot tell you. I have partially tabulated a number of observations, but have not the results worked out in a form to answer properly.

Mr. Jones—I think Mr. Grover has been altogether too modest in his explanation of his experience with high pressure. If he cared to tell the members what he did last winter in keeping up the pressure in Oakland, I think it would be interesting. He stayed with it night and day.

Mr. Holberton—Have you ever tried a direct acting compressor?

Mr. Jones—We have not tried them because there has been some difficulty on the part of the compressor builders to secure quick operation of the valves. They found it difficult to get a valve that would operate quick enough to coincide with the speed of the gas engines. Gas engines of small units must of necessity run rapidly, so that the speed of gas engines heretofore has been too great to successfully operate gas compressors. But that has been successfully overcome by changes in the valves of the gas compressors. I have recently seen a valve designed by one Eastern builder which, I think, will obviate some of the troubles of speed.

Mr. Pennoyer—Would it not be more economical, where a gas works has an excess of residuals, to use a steam-driven compressor? I note Mr. Grover says it takes 10 per cent. of the amount of gas compressed to operate the gas engine. If we have about our plant enough residuals to operate the entire steam portion of our gas works and also have enough residuals to operate a steam engine to drive this compressor, we would not have that loss of 10 per cent.

Mr. Miller—In Los Angeles we have driven compressors with a loss of only about 3 per cent., or taking about 3 per cent. of the gas compressed; 10 per cent. I should say would be very excessive.

Mr. Lowe—Do you use your gas engine in pumping from Los Angeles to Pasadena?

Mr. Miller—We did; but we use electric power now.

Mr. Lowe—Regarding gas engines as employed in the natural gas fields, my understanding is they use about 4 per cent. to 4½ per cent. in the gas engine of the amount of gas compressed in raising it to several hundred pounds pressure. It strikes me that 10 per cent. is very high. I know of a gas works in which a direct acting compressor is being used that is working very satisfactorily. I know the company has just purchased a second compressor, but I cannot tell you as to the practical results.

The President—Perhaps Mr. Holberton can tell us something about the use of electric power.

Mr. Holberton—I do not know that I can give you very much information. I know that they are operating certain gas apparatus in Oakland by motors, and as far as I know with perfect satisfaction. Mr. Jones' greatest care is to see that the current does not give out. The bulk of the apparatus in Oakland is operated from storage batteries, so that I do not think they have ever had that particular trouble, but that would be the case in smaller works without storage.

The President—We should like to hear from Mr. Stirling.

Mr. Stirling—I am a novice in the gas business, having just joined the Association, but I agree with Mr. Holberton that you should have two sources of power in a plant of that kind. Electric power I think would be cheaper than using 10 per cent. of the gas to compress the gas; but I understand from Mr. Grover the inefficiency was due to the altitude and that it would not occur in a lower altitude.

Mr. Miller—Another reason is that 100 pounds is too high. Mr. F. H. Shelton, who is an authority on the subject, has put himself on record that from 20 to 25 pounds is the highest economical working pressure. If you are running works sending out 300,000 or 400,000 feet an hour high pressure will not pay.

Mr. Pedersen—I should like to know what trouble Mr. Colquhoun had with his governors. And as to pipe; there are soils, of course, where steel pipe is not the best thing. I noticed in the rear of the hall to-day some connections of pipe with machine joints. Could that be used with high pressure, and if not, why?

The President—I think that possibly Mr. Gutsch could tell us something about governors.

Mr. Gutsch—The governors check absolutely any damage to the meter and prevent trouble in the house by fluctuation. There have been a good many governors designed. I believe most of them are not automatically closing in case of accident nor are they adaptable where the pressure changes, particularly where the compressor works only part of the time and where the compression is a thing that has to be regulated. I believe Mr. Lowe has set up a private concern in Pasadena to study governors.

A Member—We have aimed to get a governor that would be self-closing under high pressures and one that would also regulate fluctuations as high as from 100 pounds, if necessary, down to $\frac{3}{16}$-inch. This governor is something new, and while it has been tried exclusively in one town with so far very good results, we do not know yet whether it would work under other conditions, and should like to wait until we know more about it. I know a man in Los Angeles who has designed another governor for the same purpose, and from what he has told me he can regulate down to $\frac{1}{16}$-inch. A governor is certainly an important feature in high pressure.

Mr. Weber—We have had some experience with high pressure. We have individual governors, as Mr. Jones stated in his paper. So far not a single diaphragm has given out, and we have in the neighborhood of 500 installed. These governors are excellent, provided we have one percentage more on the high pressure end than on the low. They are set so as to give about 4 inches water pressure at each outlet. We have no storage tanks at our end and have very little trouble in maintaining our pressure in town. It has gone low, but not low enough to do any great damage. Once in a while we have had low pressure, when a stove burns about half what it should burn, but it has not gone entirely out at any time. The workmanship of laying pipe should be first-class. If you have had your mains under 3 or 4 inches water pressure and then apply about 25 pounds pressure the leakage often will be many times what it was with low pressure. Any man attempting to put in a high pressure gas main should use nothing but the very best fittings and pipe and should not crowd his men as to getting the work done. He should see that all the work done is done well, because the loss from leakage will continue as long as the pipe is in use. I believe that high pressure should not very much exceed 25 pounds. An extra horse power is required, too, to force the pressure higher, and power is expensive. Storage tanks should also be provided in case of temporary shutdowns. The expense of storage tanks is, I understand, very nominal compared with their importance. I think that no man should pay more attention to any part of his business than the gas man to his tanks.

Mr. Lowe—Did you say that you had one governor diaphragm fail?

Mr. Weber—Not one.

Mr. Lowe—Mr. Colquhoun, did you say some of the diaphragms failed?

Mr. Colquhoun—No. I had one governor break. It exploded; but that was owing to the carelessness of the man. I think it will be only a short time until all gas companies increase their pressure somewhat.

Mr. Holberton—Mr. Jones says in his paper that they have prepared a table showing the pressures to be carried at different times of the day. I would like to ask if they ever tried any automatic means of maintaining a pressure which would increase with the flow of gas, doing it automatically. In other words, it seems to me that the speed of the compression is a function of the amount of gas that is being used. I believe it would be feasible to construct a compressor which would take care of that. The more gas being delivered the faster the compressor would run.

Mr. Jones—The ordinary automatic district governor now in use will accomplish that work if it is put at the Petaluma end.

Mr. Holberton—I mean something placed at the compressor to regulate its speed according to the body of gas being used.

Mr. Jones—That can only be done where there is no intervening pressure tank. It is the best practice to have compression tanks raising the pressure in them and then use automatic regulators from the compression tanks.

Mr. Holberton—I would suggest doing more than that. Maintain a gradual pressure on the tank and at the other end you have a gradual consumption. Loss of pressure in the pipes must necessarily depend to a certain extent on the amount of pressure flowing through. The initial pressure should be gradual.

Mr. Colquhoun—There is a device similar to that. I know we have one with the last compressor.

Mr. Holberton—You mean it operates to maintain a constant pressure. I want to maintain an increasing pressure as the consumption increases.

Mr. Lowe—Mr. Pedersen raises a question as to the use of cast iron pipes. There is no objection to the use of cast iron pipe so far as the method itself is concerned; but if there is any particular advantage to be derived from high pressure delivery it is in the lower cost of street mains. If you use small pipe a cast iron pipe becomes nothing more or less than a pipe stem and is broken very readily. At one time cast iron pipes were used for service pipes, but they were very glad to adopt wrought iron for services because it did away with the breakage of the very small cast iron pipes. I think you all know 2-inch street mains were formerly laid with cast iron pipe, and the use was discontinued

because of the fact that they broke so readily. For the same reason I would be afraid to use cast iron pipe on high pressure work. In addition to that cast iron pipe can never be as smooth on its interior surface, and the rougher the pipe the greater the obstruction of the flow of gas.

Mr. Pedersen—Is there not more leakage in cast iron pipe?

Mr Lowe—The question of sand holes is of minor importance. It is true that the porosity is very much greater, and if you were to get into very high pressures you would lose a great deal more through the pores; but I do not think that question would arise in ordinary commercial gas delivery under high pressure.

Mr. Jones—Regarding the statement of Mr. Grover that in compressing he uses 10 per cent. of the gas compressed, he had reference to a small engine where the efficiency was probably 2½ times less than would be obtained in modern gas engines; and I am not quite sure that the altitude does not affect the operation of the engine. Surely it would affect it to the extent of about 9 per cent. less efficiency at 2,500 feet elevation. By the use of oil under boilers for compressing gas it can be done with less than 1 gallon of oil per 1,000 cubic feet. We have never had any stated experience with the operation of large units of gas engines or large gas compressors, so that I would not like to have that statement go out as applying to gas compression where it is operated by gas engines. I believe there is no more economical source of power than the gas engine. I am a firm believer in both the present and the future of the gas engine for all purposes. Mr. Miller's statement regarding the pressure on mains advised by Mr. Shelton not exceeding 20 pounds to the square inch is corroborative of the statements in my paper. I believe we ought to study how low a pressure we can carry rather than how high a pressure we can carry. When you are discussing this subject you begin to mix up inches and pounds. When you are talking about ½ of a pound pressure you are talking about twice as high a pressure as you are carrying on your mains under low pressure. Mr. Weber's statement means that he has 100 per cent. overload on his mains to overcome and provide 4 inches of water pressure on the house pipe. Another point to be considered is that compression tanks act as storage holders, and I firmly believe that working these compressors up to the economical limit of 80 pounds to the square inch into these compression tanks is the best practice. Then cut your street main pressure down to any point desired. As to the matter of handling governors, as brought out by Mr. Gutsch, every high pressure governor should have a sufficient valve opening, so that, should the pressure go off entirely, there will be a supply of gas to the consumer. It would be a calamity if the pressure should go off entirely when the bathroom lights and other similar lights were burniug at night. But the governors now in use have ample valve openings, and the valve itself is fastened by a joint to the lever connected with the diaphragm which operates the valve, so that if the pressure goes off the line the diaphragm drops and the valve is lifted, permitting enough gas to pass through to keep the gas burning. I found that an ordinary No. 1 Equitable governor will furnish 100 feet of gas per hour through these openings at 4 inches pressure. In regard to automatic compression, we have several good ones that will so operate. The Fulton governor, for example, will so operate; that is, should the gas be shut off by any accident the governor will close and it has to be reopened by hand.

Mr. Lowe—It may not be amiss to say a word about the construction of pressure tanks. Last year in advocating pressure tanks I stated that a tank about 30 feet by 4 feet 6 inches, made of $\frac{3}{16}$-inch steel, would have a safety factor of four if operated at about 75 pounds pressure. Experience has shown that they cannot be caulked sufficiently tight to keep in the gas, and tank builders now admit it. The experience has been that it requires at least ¼-inch metal to permit of caulking sufficient to insure a tight job, by reason of the fact that the thinner sheets are not uniform in thickness, and do not provide a sufficient amount of metal to allow for tight work. Therefore, it is safe to say that, even on small compression tanks, you should use metal not lighter than ¼ inch, and when so made they are guaranteed tight at 150 pounds gas pressure.

Mr. Pennoyer—What is the smallest sized pipe you would advise to be used in a high pressure distributing system for mains?

Mr. Jones—In the last 2 years I have changed my ideas as to the size of pipe. When the high pressure system in Fresno was laid out I used 1-inch, 1¼-inch, 1½-inch, and nothing larger than 2-inch pipe. If I were to lay out an ideal system now I would use nothing less than 2-inch for main pipe and couplers, as described in my paper, and ¼-inch service pipes.

Mr. Pennoyer—How would you connect the service pipe?

Mr. Jones—It could be done very safely and well by using any of the heavy saddles made for that purpose. Use lead gasket between the pipe and the saddle. A stopcock should be screwed into the saddle. Drill the hole through the opening of the stopcock; after removing the drill there is no loss of gas, no danger to your employees, and the hole that is drilled even with a ⅝-inch drill is amply large.

On motion of Mr. Pennoyer a vote of thanks was passed to Mr. Jones for his very instructive paper.

(To be Continued.)

SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, ENGLAND, August 10th, 1904.

Profit Sharing.—A Case for Cheap Gas.—Oxide Revivified While You Wait.

The report of the Directors of the South Metropolitan Gas Company on the working of the undertaking, for the 6 months ended 30th June, is notable for the prominent position given to profit sharing. In announcing a reduction in price to 2s. per 1,000 cubic feet, the lowest price ever reached in London, that system is credited with no small share in bringing about such a satisfactory position of affairs. As some reference was made to the procedure at the South Metropolitan Works in the course of the discussions at the recent Gas Congress at St. Louis, it will not be out of place to refer to the information furnished by the report. After duly recognizing the effect of a reduction of 8d. in the cost of coal, and a good market for sale of products, it is stated that there is a general improvement in working results, due to the great interest that the chief officers of the Company, backed by the loyal support and cooperation of their subordinates and the workmen, have shown in promoting its prosperity. The copartnership bonus during the past year amounted to £34,340, or over 8 per cent. on the salaries and wages, and the distribution of so large a sum could only be warranted on the ground that it had been earned by good work and by avoidance of waste of time or material, and that it was rightly used when received. To pay the full market rate of wages and to add 8 per cent. could not be justified except on these lines. As to the first point, the Directors are satisfied that the bonus has been earned, and as to the second, nearly the whole of the same had been saved and invested in the Company. The employees now hold nearly a quarter of a million sterling in the Company's stock, while not a few have acquired their own houses. The three workmen Directors have given entire satisfaction to their colleagues. The Directors are required under the scheme to give a special report on the working of the same in every third year.

The interesting feature of this report is the prominent position given to the way in which the bonus is spent, and it is scarcely too much to say that this is the *crux* of the whole question. The British workman, like others higher in the social scale, is apt to incline to the view that anything in the way of a bonus simply means a night out. Before any hope of success can be expected for a profit sharing scheme, this element must be reduced to a very low percentage. Then it is venturing upon tender ground to influence the spending of the money. He likes to be quite independent on this point and resents too searching inquiries, perhaps because the record is nothing to be proud of. Good advice costs nothing; it is therefore apt to be valued too cheaply, but one can scarcely avoid the opinion when reading that such a large proportion of the workmen make good use of the bonus, that in addition to the money payment a great deal of educational work by precept and example has been done in a quiet way, and that without a proper preparation of the ground in this manner, the satisfactory position now recorded would never have been attained. Profit sharing is indubitably a success, at the South Metropolitan, but it has required a great deal more than the bare payment of 8 per cent. on the wages to make it so. And perhaps this is one reason why so obviously satisfactory an arrangement finds so few imitators.

Another interesting feature of the report is the fact that the increased consumption, notwithstanding the reduction in the quality of the gas supplied, is less than the actual growth of the business. It was claimed by some authorities that the effect of reducing the quality from 16 to 14 candles would mean a largely increased consumption, and that the consumer would be obliged to use more gas to obtain the same effect. But the increase for the half year has been only 4 per cent., against which there is an increase of 2 per cent. in the number of ordinary consumers, 6 per cent. in ordinary cooking stoves, over 11 per cent. in slot meters, and 15 per cent. in slot meter stoves. No mention is made

in the report of incandescent burners and it would be interesting to know whether there has been any important increase in the adoption of these appliances. If there is anything in the claim that the consumer must increase his consumption 20 to 30 per cent. he may safely be trusted to be sufficiently wideawake to his own interests to go in largely for the incandescent burner. Apart from any question of augmented consumption it would appear that the consumers in the South Metropolitan district have followed the example in other places, and availed themselves of the economy and efficiency afforded by this appliance. But after making every reasonable allowance for this feature, there is no evidence of any substantial loss to the consumer by being served with 14 instead of 16-candle gas. In any case the replacement of flat flames by incandescents is obviously likely to obtain to an important extent, and it might be urged that in this matter the remedy is in his own hands, and that if he chooses to retain the flat flame he cannot reasonably claim preferential consideration. It has been shown over and over again that the users of the atmospheric burner, and heating, cooking and incandescent lights, form a large, increasing majority, and as such they are entitled to the first claim. This is perhaps the strongest argument in favor of cheap and so-called low power gas. A notable feature in the matter is that the South Metropolitan is to a greater extent than usual a "consumer's" company. A large portion of the stock is held by the users and customers and as such no substantial injustice could be done to them without the same being exposed at the shareholders' meeting. Under such circumstances the fact that the consumers have accepted the change in silence is proof positive that their interests have not suffered.

Speaking generally, the prospects of the gas industry are at present particularly good. Coal is cheap, coke is fetching a good price, tar and ammonia are moderate but not bad, the very low consumption and excellent quality of light that can be obtained from the incandescent burner have secured for that appliance a position that has never been attained by any other agent for artificial lighting, the output of cookers still increases, with the result that reductions in price are general, and with cheaper rates there is greater inducement to use gas for heating, motive power and technical purposes. Very few companies find it necessary to hold exhibitions, canvass or adopt any measures for securing new business, as the natural growth is sufficient to keep them actively employed in providing for extensions. There is some room for increasing the consumption per consumer, which is a more profitable line of enterprise than getting new ones. If over 50 per cent. of the consumers are sufficiently satisfied with the gas cooking stove to become permanent users, it should not be a difficult matter to increase the proportion say to 80 per cent. Gas fires, engines and various technical appliances have scarcely been employed at all. Why should these things be left to advertise themselves?

The suggestion that oxide can be revivified and rendered fit for use inside of 24 hours reads like a fairy tale, yet this is what the British Drying Towers Company claim to be able to do, on the authority of the manager of the gas works at Christiania, Norway. An apparatus capable of dealing with 8 to 12 tons of oxide per day can be contained in a tower 40 feet high and 15 by 11 feet in section. The mechanical parts comprise a fan or other arrangement for creating a draft of air, and a large endless band conveyor. The oxide is spread upon trays to a thickness of 4 to 6 inches, and these trays are packed upon suitable cages, and introduced on the up side of the conveyor. When in proper position, the cage engages with clutches on the conveyor, and is carried up to the top, across the top pulley, and down the other side. A current of air is driven up a central shaft, and escapes through openings properly spaced, so that the material, carried slowly, at the rate of a few inches per minute, is continually exposed to strong currents of fresh air. Each cage has a journey of 70 to 80 feet, the time occupied being 4 or 5 hours, but of course the rate of travel and the height of the tower can be adjusted to the work to be done. The tower may be built of any suitable material, and it is claimed that one man can attend to the whole arrangement, including loading and unloading the cages. Although novel as far as gas works are concerned the machine has been successfully applied for other purposes. It is not apparent at first sight where the advantage of treating the oxide to a sort of merry go round ride comes in. One can see the advantage of spreading the material in thin layers and exposing the same to a current of air, but the force expended in lifting the material 40 feet does not assist the process at all. It would be applied to better advantage in shaking or stirring the oxide. All the work done by the tower could be equally well done in a 1-story chamber at ground level. No evidence as to the cost of mechanical revivification is forthcoming, but it would be specially applicable to well aged material, which is often rejected on the score of the expense of revivification rather than because it is fully saturated. Under present working it is necessary to have a reserve of oxide at least quite equal to the quantity in use in order to work comfortably and safely, but with a machine capable to restoring at the rate of 10 tons per 24 hours, the case would be different. A set of 4 boxes could be safely worked with one reserve lot, and there would be a corresponding saving in respect to revivifying floors. Some forms of oxide, particularly when new, would be likely to give a lively time in the tower, and it would appear that the process is better suited for finishing work than for dealing with material fresh from the purifier. The drying tower may be valuable for some purposes, but it scarcely poses as the simplest and cheapest means of introducing a current of air to spent oxide. To make it successful the air must be charged with moisture or other means adopted for introducing the water absorbed during the revivification.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

MR. FRED. B. WHEELER, General Manager of the Binghamton (N.Y.) Gas Works, will close his connection with that concern next Wednesday. He has accepted a position with the Semet-Solvay Company, of Syracuse, N. Y., and after the date mentioned Mr. Wheeler's post office address will be care of the Semet-Solvay Company. He was the recipient, at the last meeting of the Board of Directors of the Binghamton Gas Works, of a very substantial testimonial in cash and a handsomely engrossed set of resolutions, as tokens of their appreciation of his good work at Binghamton and of their personal esteem.

MR. WHEELER'S successor at Binghamton is Mr. E. E. Eysenbach, of the Columbus (O.) Company.

A SPECIAL meeting of the Wisconsin Traction, Light, Heat and Power Company is called for the 2d prox., in the Company's offices, Milwaukee. It is understood the incentive for the meeting is to arrange for the purchase of the Fox River Valley Gas and Electric Light Company, which concern supplies gas and electric currents in Appleton, Neenah and Menasha, Wis.

MR. GEORGE W. BLOOM, JR., will remain in charge of the plant of the Baraboo (Wis.) Gas Company. The Company's new coal gas installation is in every sense up-to-date.

MESSRS. CHESTER SNYDER and George F. Coffin have filed a certificate with the Secretary of State that the corporation existence of the Ogdensburg (N. Y.) Gas Company has been extended for a period of 50 years.

TOLEDO, O., wants to refund a lot of its natural gas bond issues that are coming due. Investors do not seem, however, to wait in line for a chance to bid on the proposed new issues.

THE Laclede Gas Company, of St. Louis, Mo., has declared the regular quarterly dividend of 1 per cent. on its common stock. It is payable the 1st prox.

THE Utica (N. Y.) Gas and Electric Company has arranged to extend its services to the outlying settlement of Oriskany.

A CORRESPONDENT in Mobile, Ala., writing under date of the 19th inst., says: "Articles of incorporation were filed this week in the Probate Court by William L. Harder, F. Brucker, O. N. Rauschenberg and John H. Pritchard, to incorporate the Harder Gas Furnace Company with a capital stock of $500,000. All of the $500,000 has been paid up, so it is said, and the Company expects to begin operation at an early date. The concern will have a legal existence of organization for 20 years. The following have been chosen as officers: W. L. Harder, President; F. Brucker, Vice-President, and O. N. Rauschenberg, Secretary-Treasurer. The principal stockholder is W. L. Harder, who has 4,997 of the 5,000 shares. The purpose of the Company is to erect a large plant in this district for the manufacture of gas from coal and for the construction and sale of gas producers. It is also provided for in the articles of incorporation that the concern will deal in and repair machinery, especially large boilers. The Company owns a patent for the manufacture of gas from coal, and it is claimed by the promoters of the concern that by the new process, 'all the smoke and dirt can be taken' from bituminious coal, and an excellent fuel made

Just how the smoke and dirt may be removed is not clearly disclosed, but the Harder's say it has been tried in the Birmingham Rolling Mills, and is said to have given satisfaction for the 6 months it was used. An official of the Company stated yesterday that not only would a large plant be erected in Birmingham, but that it was the intention of the management to construct branch houses in various sections of the country."

A CORRESPONDENT in Toronto, Can., writing under date of the 18th inst., incloses the following: "The shareholders of the Consumers Gas Company, of this city, at a special meeting held the 16th inst., unanimously adopted a resolution, authorizing under the Act passed at the last session of the Dominion legislature an increase in the capital of the Company of $1,500,000, divided into $50 shares, and empowering the Directors 'to issue and dispose of so much of the same in the manner provided by the Act at such times and places, and in such amounts as they may deem advisable.' The present capital stock is $2,000,000. Dr. Larratt W. Smith, the President, pointed out that the Mayor of the city was now entitled to purchase stock in the Company, and whenever he succeeded in getting $10,000 worth of shares he would be entitled to a seat in the Board. Manager Pearson stated that they now owed the bank $286,781, and in the course of the next 2 years they were likely to spend about $1,300,000. They were about to erect a new gasholder, which, with the foundations, would cost about $165,000. In addition to that, they had to pay for the coal and coke storehouse to replace the one destroyed by fire. They were also laying a main pipe to supply the northwestern part of the city, which would cost in the neighborhood of $70,000. Mr. Pearson said $650,000 would be spent on the new works at the Don. The capacity of these works would be sufficient for Toronto for 25 years. The new stock will be offered for sale at public auction within a fortnight."

MR. ADAMS, President of the Portland (Ore.) Gas Company, emphatically denies that negotiations for the merging of that Company with the Portland General Electric Company are underway.

"A. S. W." forwards the following, from Cincinnati, dated August 18th: "In response to a request from the Board of Public Service, an opinion has been rendered by the City Solicitor regarding the operation of the Conover contract, under which the Cincinnati Gas and Electric Company has been opening the streets without permits. In the opinion of the City Solicitor this Conover franchise is perpetual and cannot expire until the city buys the gas plant. The Conover contract was entered into nearly 65 years ago. The opinion states that the city has the right to make any reasonable regulations as to the time, mode and manner in which excavations for the laying of gas pipes should be made, and could enforce such regulations, but the suggestion is made that such authority be vested in Council rather than in the Board of Public Service. The latter, recognizing from the City Solicitor's opinion that it has no control over the Gas and Electric Company, will ask that an ordinance be drawn up giving the Board such power."

THE Elyria Gas Engine Company, to manufacture gas engines of several types in Elyria, O., has been organized. Its President and Treasurer is Herman Ely; General Manager, A. E. Taylor.

GENERAL MANAGER PETER ENGLISH, of the Deadwood-Lead (S. D.) Gas Company, says that gas will be supplied from that plant by Oct. 1.

THE proprietors of the Hammonton and Egg Harbor City (N. J.) Gas Company have purchased the electric plant hitherto operated in Hammonton by the Atlantic County Electric Company.

THE proprietors of the Perth Amboy (N. J.) Gas Light Company have reduced the selling rate to $1.40 per 1,000 cubic feet, a concession of 20 cents per 1,000.

THE sale by the Bridgeport (Conn.) Gas Light Company of certain real estate holdings on Housatonic avenue does not in any sense mean that the Company is preparing to abandon its works on the avenue named.

THE *Gas World* says that in Germany acetylene stations have been classified as extra dangerous, an additional 25 per cent. having been added to the index number. This was appealed against, but without success, the official reasons being that acetylene does not, with anything like the readiness of coal gas, diffuse into and become diluted with air, so as to become safe against being kindled by coming in contact with a flame; that the limits of explosibility are much wider than with coal gas; that its kindling temperature is very low; that its freedom from poisonous character is not very material, since cases of gas poisoning at the works are very rare, for the gas gives plenty of warning through producing headaches and the like; nor is it material that the presence of a flame is strictly forbidden at the acetylene stations, nor that there is no fire used in manufacture, nor that the working is done by hand, only for a few hours each day, nor that the rooms in which the acetylene gas is made are relatively large. The whole industry sent in protests against this; Dr. Eitner and Dr. Bunte support the Government view; the German Imperial Assurance Department stuck to their point and have recently reaffirmed it with redoubled emphasis.

ADVICES from Switzerland state that last year in that country 13 persons were killed by electricity. Of the 13 fatalities, 5 occurred to persons employed in connection with the generation and distribution of electricity, one to a fitter of an electric firm and 7 to persons not connected with the electrical industry. In the case of the 5 accidents to the members of the staff of electricity undertakings, it appears that the victims themselves were mostly to blame. All the fatalities were caused by alternating currents, the voltages of which were 130 in 1 case, 500 in another case and from 5,000 to 10,000 in 9 cases. In two instances the exact pressure could not be ascertained.

THE Brooklyn Union Gas Company has accomplished very much this season towards bettering its distributing system, which certainly needed overhauling.

THE town of Kennett, Pa., is desirous of having a gas supply.

LOOK up the "ad." in this number of the Consolidated Gas Company, of New York, respecting the gas ranges, etc., which it has for sale.

Hydro-Electric Development in Mexico.

Vice Consul-General Conley, writing from Mexico City, recently remarked: It is commonly asserted that the principal obstacle to manufacturing in Mexico is the lack of native fuel, but this is actually not so great an obstacle as it appears. The people are just beginning to wake up to the vast unused water power of this country, which, fortunately enough, exists in great abundance near the larger centers of population. There are but very few large streams in this Republic, but owing to the mountainous nature of the greater part of its area there is an abundance of small streams, which, owing to their rapid fall, offer a great amount of power to be utilized. Certain obstacles, however, have to be overcome in using this water power. One especial fault is that many of the streams have dry beds for about 6 months of the year. The problem to be solved in such cases is how to profitably utilize the power which can be derived from such streams during the rainy season, when they are full. In some cases where power from streams that are dry during part of the year is now being utilized to generate electric power for lighting, etc., coal or other fuel is used during the dry season. The exclusive use of coal or other fuel for generating steam to run the plants would render the cost of their operation prohibitive to profits, but by using the water power for some 6 months of the year profits can be made.

Another great obstacle, similar to the one which is encountered in some of our own Southern States, is that of vegetable growths, such as water hyacinths, which at the present time greatly impede the use of water from streams infested with it. This obstacle has, however, been overcome to a very great extent in the United States, and there is no reason why it cannot be overcome in Mexico.

Of the great abundance of water power with which this Republic is supplied, it is estimated that not more than 250,000-horse power is being utilized or is in the course of development at the present time. The potential horse power has never been estimated with any degree of accuracy. According to an article which appeared in the *Mexican Herald*, this city, recently, the average cost of power derived from steam in this city is between $190 and $225 Mexican currency, or $100 United States currency per horse power per annum. The Mexican Light and Power Company, a Canadian Company, which is installing an electric power plant at Necaxa, in the State of Puebla, proposes to sell electric power in Mexico City at $120 to $125 Mexican currency, or $55 United States currency, per horse pawer per year. This Company proposes to develop ubout 100,000-horse power, of which 80,000-horse power will be transmitted to this city.

The Market for Gas Securities.

There was some, in fact good, investment buying on account of Consolidated gas last week, with the bulk of the trading at prices satisfactory to the purchasers. The closing today (Friday) was 195½ to 195½, ex div. of 2 per cent. The debentures are bid at 170, the offering prices on holders' account being 173. The scale difference between the regular shares and the debentures seems to us as quite a fraction in favor of the latter. City gas bonds are all higher.

Brooklyn Union is nominally 213 to 220 for regular stock, and 184 to 184¾ for the debenture 6's. Here the disparity seems to favor the regular 10 per cent. payer. Baltimore Consolidated is 80½ to 82½, and the signs are that the up-New-York-State contingent so deeply interested in electrical matters in Baltimore will have to pay the right price for Baltimore gas before they get control. Hudson County (N. J.) Gas is sought for at 80; and no wonder, for at the price it is a purchase. Peoples, of Chicago, is 102½ bid. Dear, old Bay State is under ½, at which figure it seems to equal the political fortunes of the purist who founded it.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 Wall Street, New York City.

August 29.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$78,177,000	100	195¼	195¼x
Central Union, Bonds, 5's	3,000,000	1,000	106½	108½
Equitable Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	118	120
Metropolitan	658,000	..	108	112
Mutual	3,500,000	100	270	300
Municipal Bonds	750,000	..	..	..
New Amsterdam Gas Co. ..				
Bonds, 5's	11,000,000	1,000	107½	109
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	35	..
1st Mtg. Gold Bds. 5 p. ct.	1,000,000	..	..	..
Northern Union, Bonds, 5's.	1,250,000	1,000	103½	105½
New York and East River..				
Bonds 1st 5's	3,500,000	1,000	111	113
" 1st Con. 5's	1,500,000	..	106	108
Standard	5,000,000	100	125	13
Preferred	5,000,000	100	145	1.5
Bonds, 1st Mortgage, 5's	1,500,000	1,000	116	117
Yonkers	299,650	500	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	213	220
" " Bonds (5's)	15 000,000	1,000	118	115
Bay State	50,000,000	50	—	—
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works	450,000	100	28	30
" 1st Mtg. 5's	509,000	1,000	93	96
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,080,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	3¾	4
" " Bonds, 5's	5,250,000	1,000	13¾	.
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Cincinnati Gas and Electric Co	29,500,000	100	104¾	105
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	97½	99
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	88¼	89½
Preferred	3,086,500	100	107½	109
Consumers, Toronto	2 030,000	50	200	204
Consolidated, Baltimore	11,000,000	100	80¼	82¼
Mortgage, 6's	3,600,000	..	..	118
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	15	17
" Con. Mtg. 5's	880,000	1,000	86	90
Consolidated G. & E. Co.'s. Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit City Gas Co.	4,825,500	50	..	50
" Prior Lien 5's	5,603,000	1,000	99½	100
Detroit Gas Co., 5's	361,000	1,000	75	75¼
" Inc. 5's	16,000	100	98½	100
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	39	40
Fort Wayne	2,000,000	..	..	..
" Bonds	2,000,000	..	85	..
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,925,000	1,000	104½	105
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	..	78	80
" Bonds, 5's	10,500,000	..	105¼	106
Indianapolis	2,000,000	..	60	70
" Bonds, 6's	2,650,000	..	103½	106½
Jackson Gas Co.	250,000	50	78	75
" 1st Mtg. 5's	290,000	1,000	101	102¾
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	..	..
Preferred	2,500,000	100	90	100
Bonds	10,000,000	1,000	109½	110

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SUPERINTENDENT.

Correspondence solicited with owners of gas plants (coal or water), in city of 10 000 or over, who wish to secure the services of a competent superintendent. Single man, 31 years of age; 10 years' practical experience in manufacture, distribution and sale of gas. Thoroughly competent on construction work and accounting. References from former and present employers. Member Western and Ohio Associations.

1523-5 Address, "M.," care this Journal.

Position Wanted.

YOUNG MAN, thoroughly experienced in all the branches of the gas business. Understands manufacture and economical operation generally; also the business and office management. Excellent references from past and present employers. Salary contingent upon results actually obtained. Address, "R.,"

1523-3 Care this Journal.

Position Wanted

A young man who has had 6 years' experience in the manufacture and distribution of both coal and water gas; gas office work; meter reading; soliciting, and running mains and services, wishes a position with some company where his services will be appreciated. Nature of position and salary secondary matters, as applicant must accept by Sept. 15th. Able to furnish A1 references.

1525-3 Address, "ABILITY," care this Journal.

SUPERINTENDENT.

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1519-eot tf Address, "MANAGER," care this Journal.

Position Wanted.

A gas engineer, having 10 years' experience in the manufacture and distribution of water gas, and in the construction of water gas apparatus, would like to engage as superintendent of a small works or foreman in a large one. Prefer a company where good results will obtain recognition. Now is employed. Address, "PINE STREET,"

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Address, "B. C. F.,"

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ONE SET OF FOUR PURIFIERS,

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Lot of second-hand

THREE-LIGHT METERS,

in splendid condition; as good as new. Also one

NINE-FOOT STATION METER,

with a capacity of 1,000,000 cubic feet per 24 hours. Address, "VINDEX,"

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Three Davis & Farnum Purifiers,

Twelve feet by 24 feet by 4 feet. Also,

One 50-Horse Power Bigelow Boiler.

All in good condition. Address,

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ONE 11-FOOT STATION METER,

With 3-partition, Parkinson drum, in good condition and repair. . .

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1521-4 MINNEAPOLIS, MINN.

FOR SALE.

One Section Wrought Iron Hydraulic Main, with Stiness tar take-off, for 3 benches of 6's.

One Section Main, for 4 benches of 6's.

Standpipes, Bridgepipes, Mouthpieces with Self-sealing Lids, for 7 benches of 6's.

One Sinuous Friction Condenser.

One Walker Tar Extractor.

Four Purifiers, 10 by 16 by 3; complete. Connections above apparatus, 10-inch.

One 50 Horizontal Return Tubular Boiler.

All of the above apparatus is in good condition, and to be sold as the Company has been obliged to purchase larger for its new works. Address, TAUNTON GAS LIGHT CO.,

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Twelve (Actual) Horse Power Otto Gas Engine.

Has been used not more than six hours altogether. Good as new.

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NO EXTRA LABOR OR OPERATING EXPENSES.

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MICHIGAN AMMONIA WORKS, - Detroit, Mich.

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GAS RANGES AT HALF PRICE.

An accumulation of ranges that have been in use, but which are in good condition, thoroughly efficient, and practically as good as new.

14, 16 AND 18-INCH OVENS.
ALL HIGH GRADE GOODS.

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LIGHTING CAPACITY, 6,000-CANDLE POWER.

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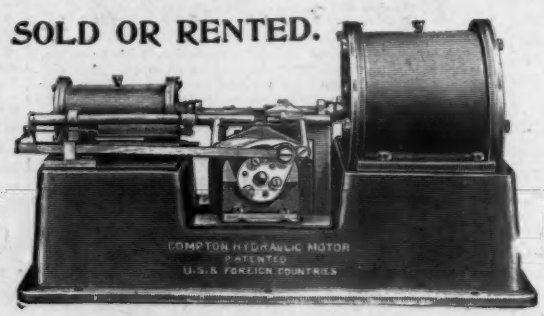

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FLOOR SPACE, 9 X 23 INCHES.

AN AUTOMATIC FLUID FUEL MOTOR.

Drop us a line and we will tell you all about the Compton Hydraulic Motor for high pressure gas service. You can get FOUR TIMES THE CANDLE POWER from a mantle burner, using a Compton Motor, than you now obtain. TEN LIGHTS will do the work of FORTY, saving maintenance on THIRTY, as to mantles and glassware. IT'S AUTOMATIC.

Up-to-date, progressive parties (gas companies preferred) wanted in every city, to place them on the rental basis.

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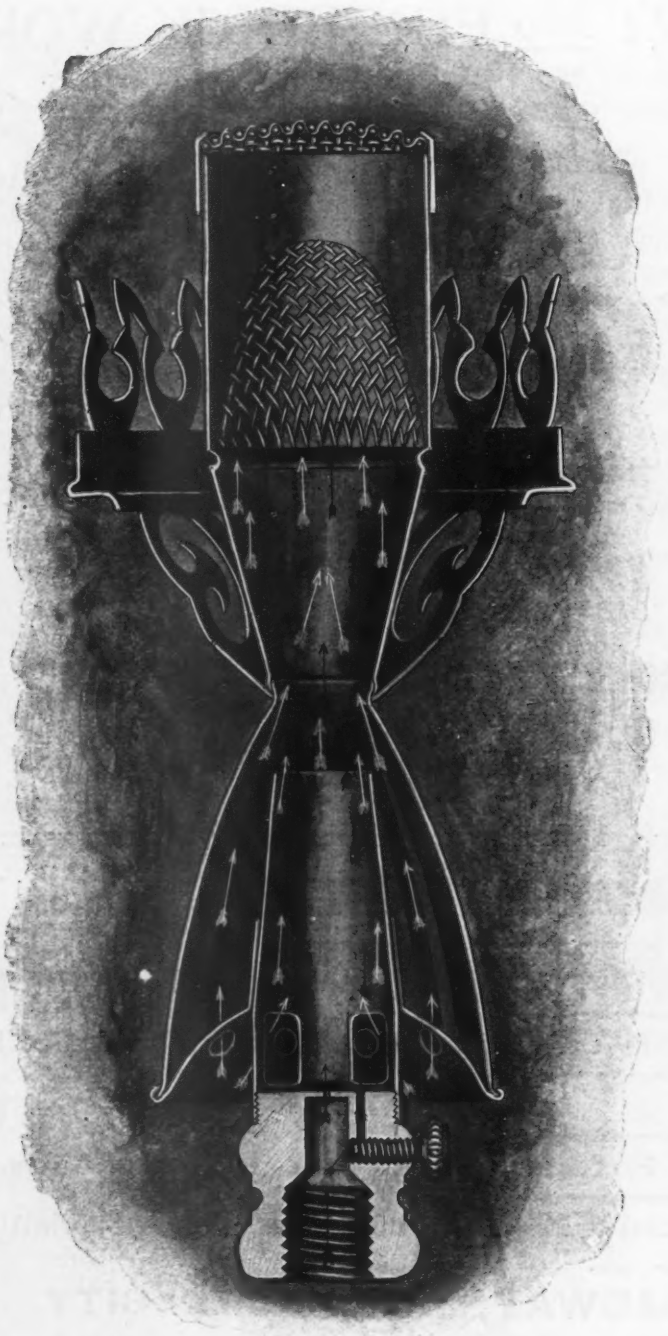

WHITE ARROWS SHOW AIR
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WHY?

IF you have wasted time examining burners which claim (by a greater than the common mixture of air with gas) to produce more light per cubic foot than burners heretofore on the market, was it not because you examined these burners without asking their makers, first, HOW they proposed producing their high percentage mixture, second, WHY they get more light?

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This is the first real innovation in incandescent gas light since incandescent gas lighting became known at all.

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Chollar's System of Gas Purification.

THE PURIFIED GAS REVIVES THE FOULED OXIDE.

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The original and the best.

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Porcelain enameled. The only construction that will stand outdoors.

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Designed especially for factory lighting. Porcelain enamel finish.

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In two sizes and eight different finishes. Very handsome and efficient.

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First practical all metal device for the purpose, we believe.

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First successful sign of the kind ever produced.

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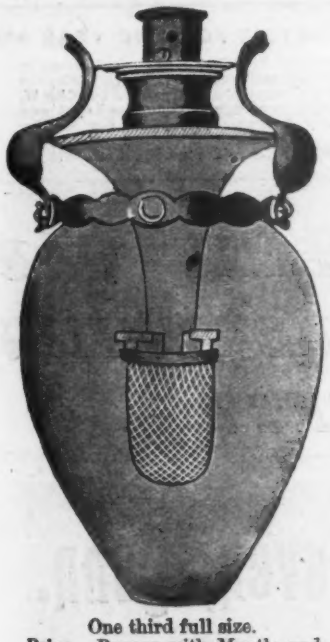
The Latest Novelty in Gas Lighting is the

PATENT INVERTED INCANDESCENT GAS BURNER.



One third full size.
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No. 1 BURNER.

The most up-to-date and economical system of gas lighting, artistic in appearance, absolutely shadowless, and readily attached to existing fittings.

A BRILLIANT WHITE LIGHT OF 65 STANDARD CANDLE POWER.

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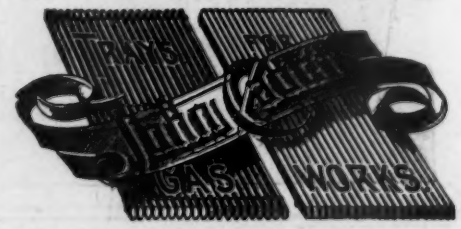

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Are Used Everywhere,

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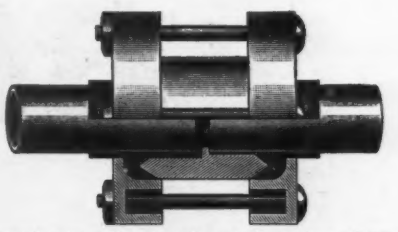
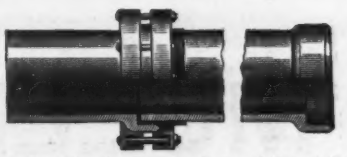
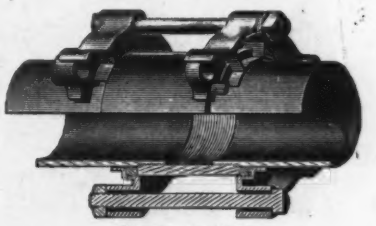


Insulating Coupling for Wrought Iron Pipe. Style 5.

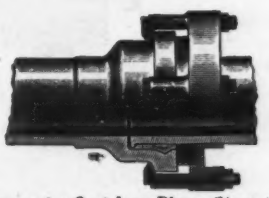


Insulating Coupling for Dresser Bell and Spigot Cast Iron Pipe. Style 6.

Regular Sleeve. Style 2.



Clamp. Style 4.



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Pipe Couplings, Sleeves, Clamps, Crosses, Toes and Ells.

My Insulating Coupling prevents the destruction of pipe by electrolytic action, in either water or gas lines.

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Gravity Discharge Type,

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Results are wonderfully effective salesmen. The success of "Link-Belt" methods in handling coal and ashes to best advantage has been so general and so signal that further argument for their adoption is seldom necessary. Write for special Coal Handling Literature.

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Analyses of Solid and Liquid Materials as Well,

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Mueller Gas Cocks are ground, not only with care to guard against leaks, but to leave the key and body surfaces ground so finely that the key will not work hard.

Mueller Gas Cocks are made in straight, oval and round way patterns; the straight being made in the standard, extra and special grade, the oval in the extra grade only, and the round in the standard and extra grades. The cock illustrated is a straight way, special grade cock.

Each cock is carefully inspected and assembled, is given a working test as near like actual service use as possible, bears the Mueller trade mark, and is *unconditionally guaranteed*.

We also make tapping machines and meter connections for gas works' use.

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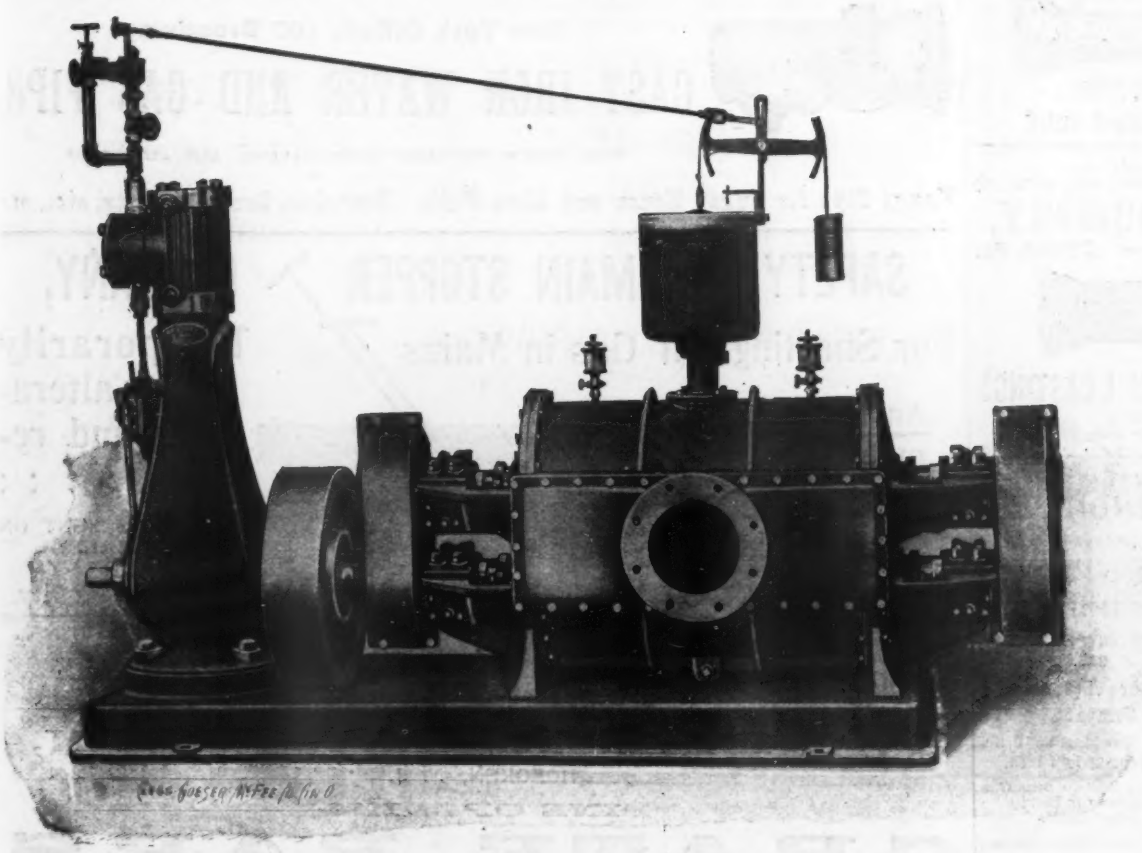

Sizes for any required capacity.

Self-oiling, adjustable bronze bearings.

Most perfect and sensitive Governor.

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Means More Hot Baths.

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Price, $16 to $45, GUARANTEED.

The No. 6, price $25, here illustrated, will heat three gallons of water per minute 50° in temperature, supplying a large family at any time with all the Hot Baths wanted.

We Make Quick Shipments.

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Economize Heat in Water Gas Plants,

BY UTILIZING A

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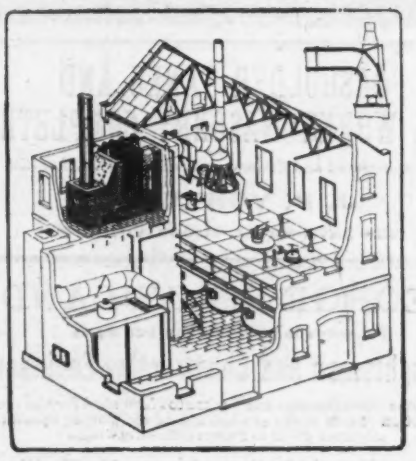

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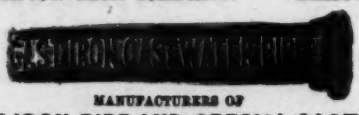

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Drilling and Tapping Pipe under Pressure
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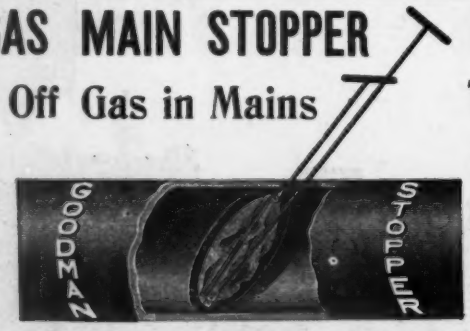

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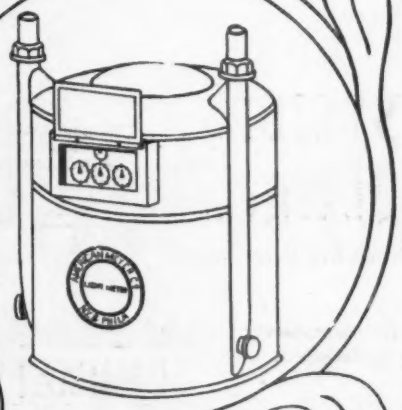
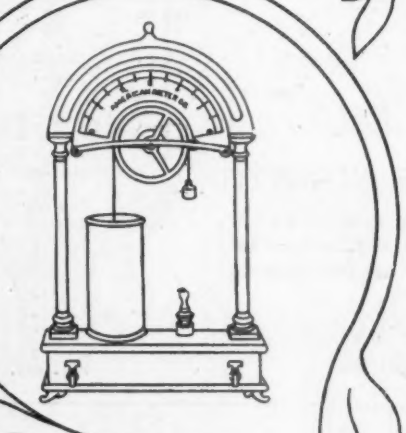
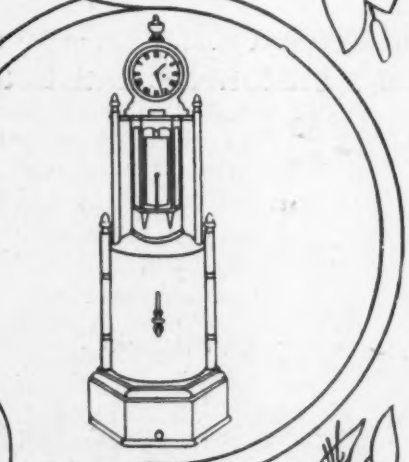
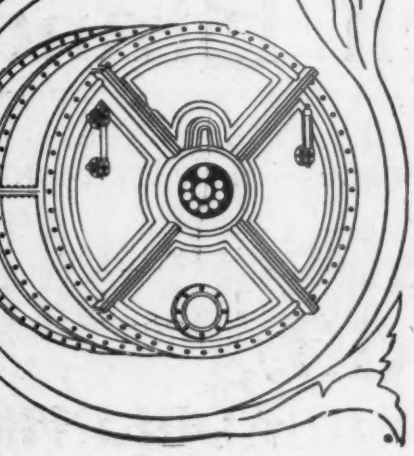




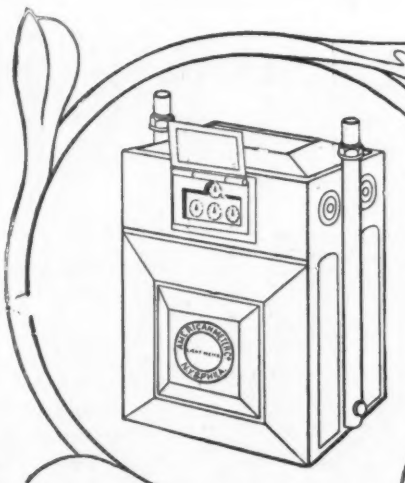


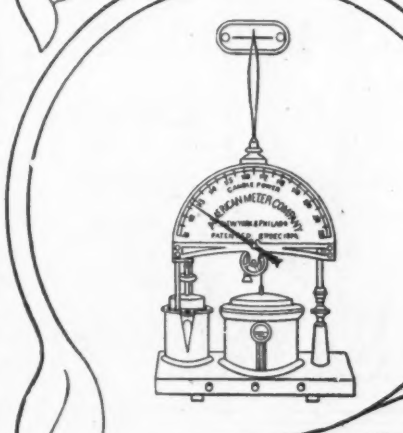


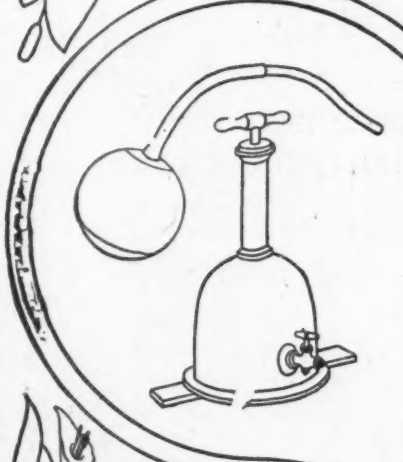
PUBLIC LIGHTING TABLE.

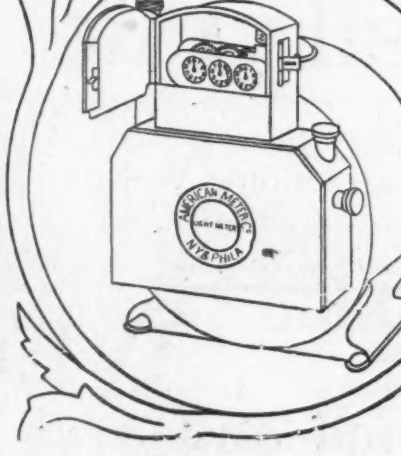
SEPTEMBER, 1904.

Day of Week.	Date.	Table No. 1. FOLLOWING THE MOON. Light.	Extinguish	Table No. 2. NEW YORK CITY. ALL NIGHT LIGHTING. Light.	Extinguish.
				P.M.	A.M.
Thu.	1	7.00 PM	11.10 PM	6.30	4.20
Fri.	2	7.00 LQ	11.50	6.30	4.20
Sat.	3	7.00	12.40 AM	6.15	4.30
Sun.	4	6.50	1.30	6.15	4.30
Mon.	5	6.50	2.40	6.15	4.30
Tue.	6	6.50	4.30	6.15	4.30
Wed.	7	6.50	4.30	6.15	4.30
Thu.	8	6.50	4.30	6.15	4.30
Fri.	9	6.50 NM	4.30	6.15	4.30
Sat.	10	6.50	4.30	6.05	4.40
Sun.	11	6.40	4.40	6.05	4.40
Mon.	12	6.40	4.40	6.05	4.40
Tue.	13	6.40	4.40	6.05	4.40
Wed.	14	8.40	4.40	6.05	4.40
Thu.	15	9.20	4.40	6 05	4.40
Fri.	16	10.10 FQ	4.40	6.05	4.40
Sat.	17	11.00	4.40	5.55	4 50
Sun.	18	12.00	4.50	5.55	4 50
Mon.	19	12.50 AM	4.50	5.55	4.50
Tue.	20	1.50	4 50	5.55	4.50
Wed.	21	2.40	4.50	5.55	4.50
Thu.	22	3.40	4.50	5.55	4.50
Fri.	23	No L.	No L.	5.55	4.50
Sat.	24	No L. FM	No L.	5.40	5 00
Sun.	25	No L.	No L.	5 40	5.00
Mon.	26	6.20 PM	8.00 PM	5.40	5.00
Tue.	27	6.20	8.30	5 40	5.00
Wed.	28	6.20	9.10	5.40	5.00
Thu.	29	6.20	9.50	5.40	5.00
Fri.	30	6.20	10.40	5.40	5.00









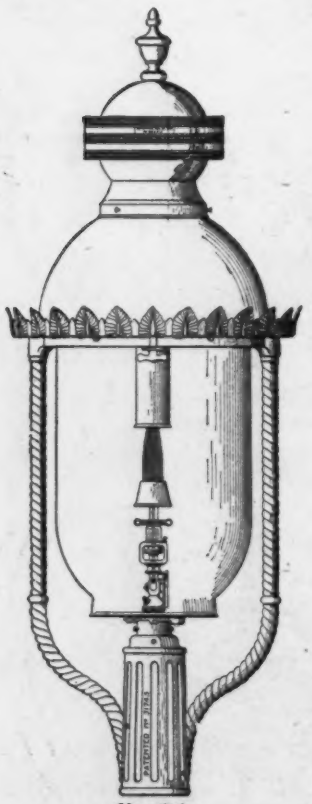
TOTAL HOURS LIGHTING DURING 1904.

By Table No. 1.	Hrs.Min.	By Table No. 2.	Hrs.Min.
January	225.00	January	423.20
February	205.40	February	367.40
March	187.40	March	355.35
April	169.50	April	298.50
May	152.30	May	264.50
June	137.20	June	234.25
July	138.50	July	243.45
August	151.00	August	280.25
September	164.40	September	321.15
October	191.30	October	374.30
November	210.30	November	401.40
December	237.10	December	433.45
Total, yr.	2171.40	Total, yr.	4000.00

NEW YORK, 97 Liberty Street. PHILADELPHIA, Broad and Arch Streets. CHICAGO, Foot of Orleans Street.
BOSTON, 814 Beacon Building. ST. LOUIS, 712 Roe Building. SAN FRANCISCO, 712 Polk Street.

WELSBACH STREET LIGHTING COMPANY

.... OF AMERICA ....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Chicago, Ills.	Newark, N. J.	Cicero, Ills.
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Winsted, Conn.	Pueblo, Col.	Lawrence, Mass.
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Schenectady, N. Y.	Fall River, Mass.	Chattanooga, Tenn.
Hagerstown, Md.	Duluth, Minn.	Tuckerton, N. J.
Malden, Mass.	New York (Mutual Co.)	Springfield, O.
Bridgeport, Conn.	Waltham, Mass.	Easton, Pa. (2d contract)
Albert Lea, Minn.	Dover, Del.	Mobile, Ala.
Brooklyn, N. Y.	York, Pa.	Conshohocken, Pa.
Kansas City, Kas.	Minneapolis, Minn.	Mason City, Ia.
Hempstead, N. Y.	Allentown, Pa.	

TOTAL SETS FOR 1903, ... 62
TOTAL DAILY CAPACITY, ... 62,950,000 cubic feet.
TOTAL SETS TO DATE, ... 508
TOTAL DAILY CAPACITY, ... 362,780,000 cubic feet.

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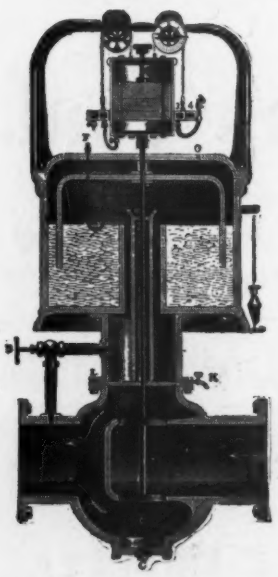

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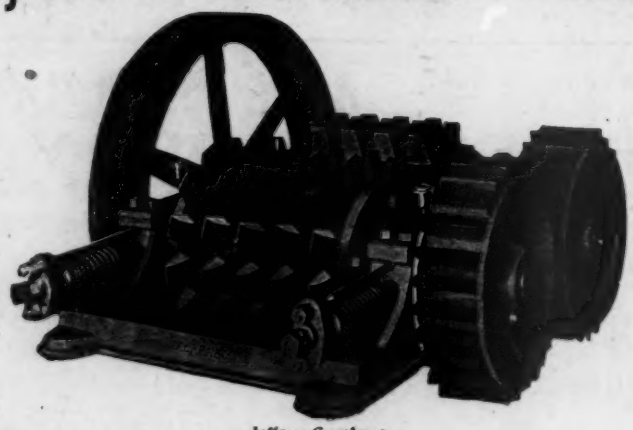

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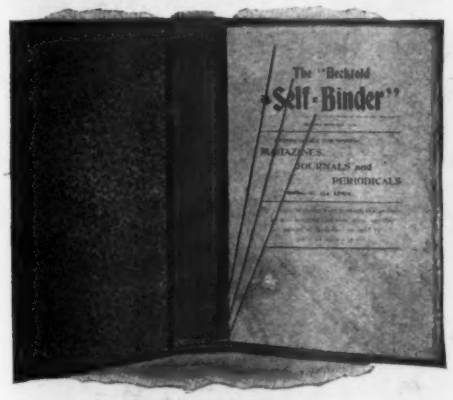

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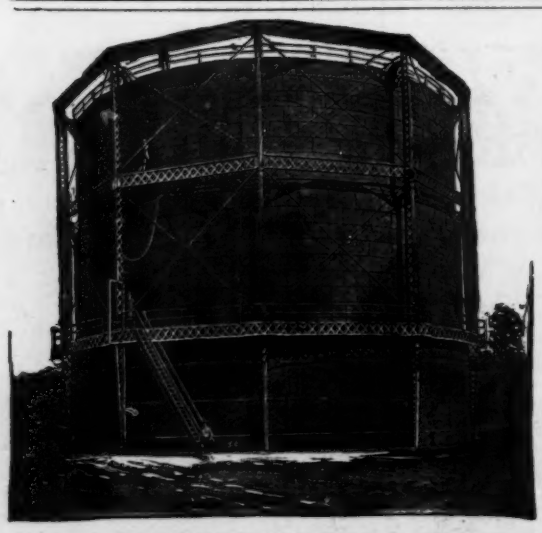

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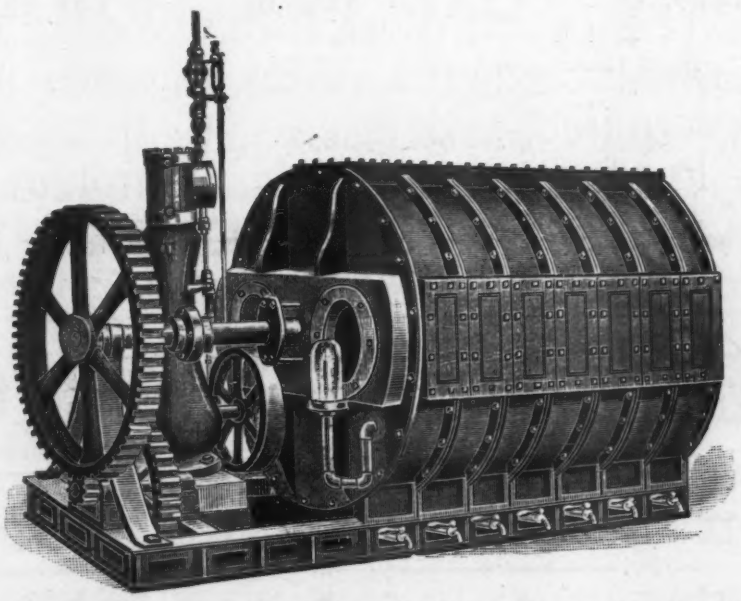

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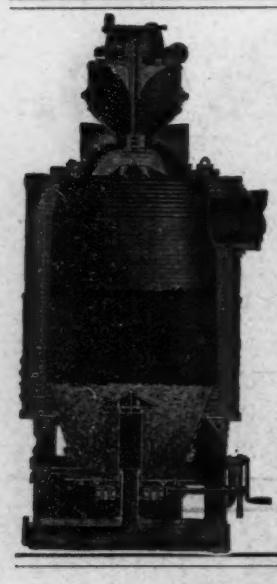

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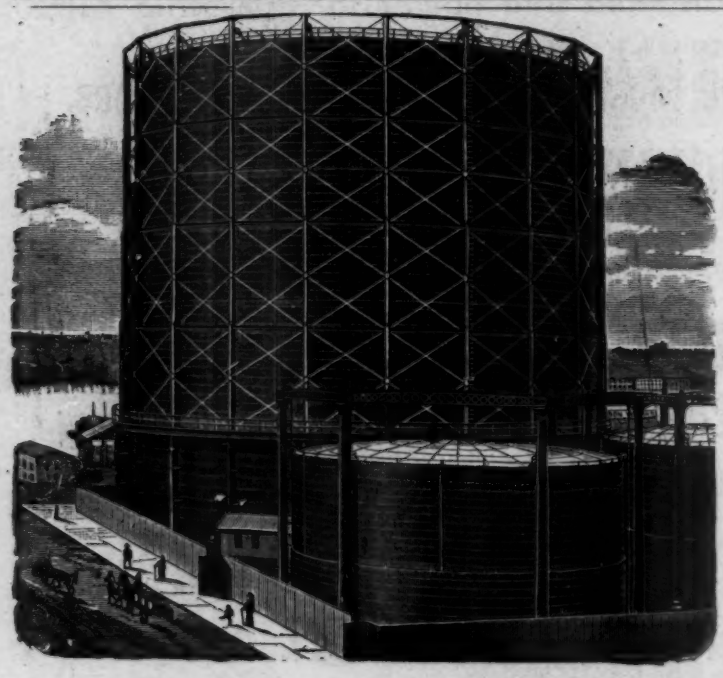

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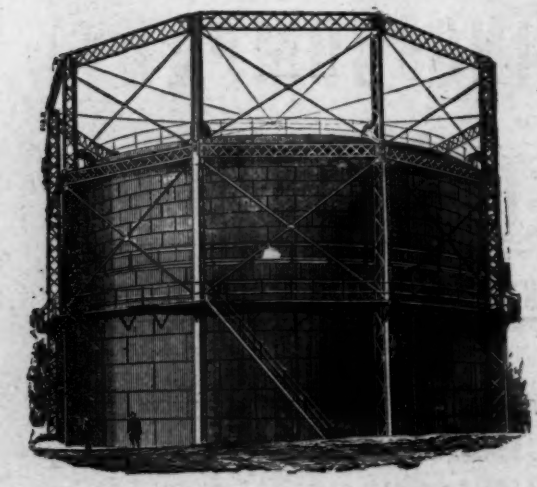

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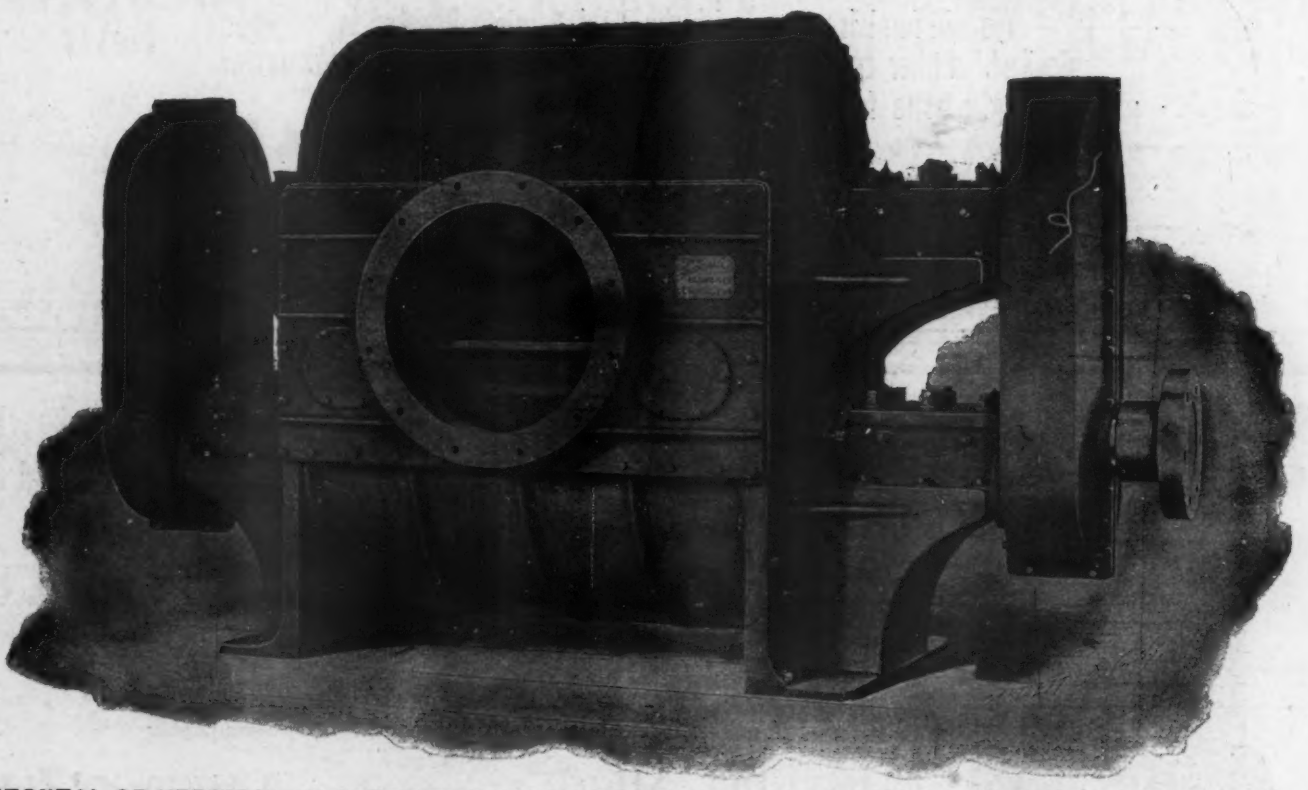

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